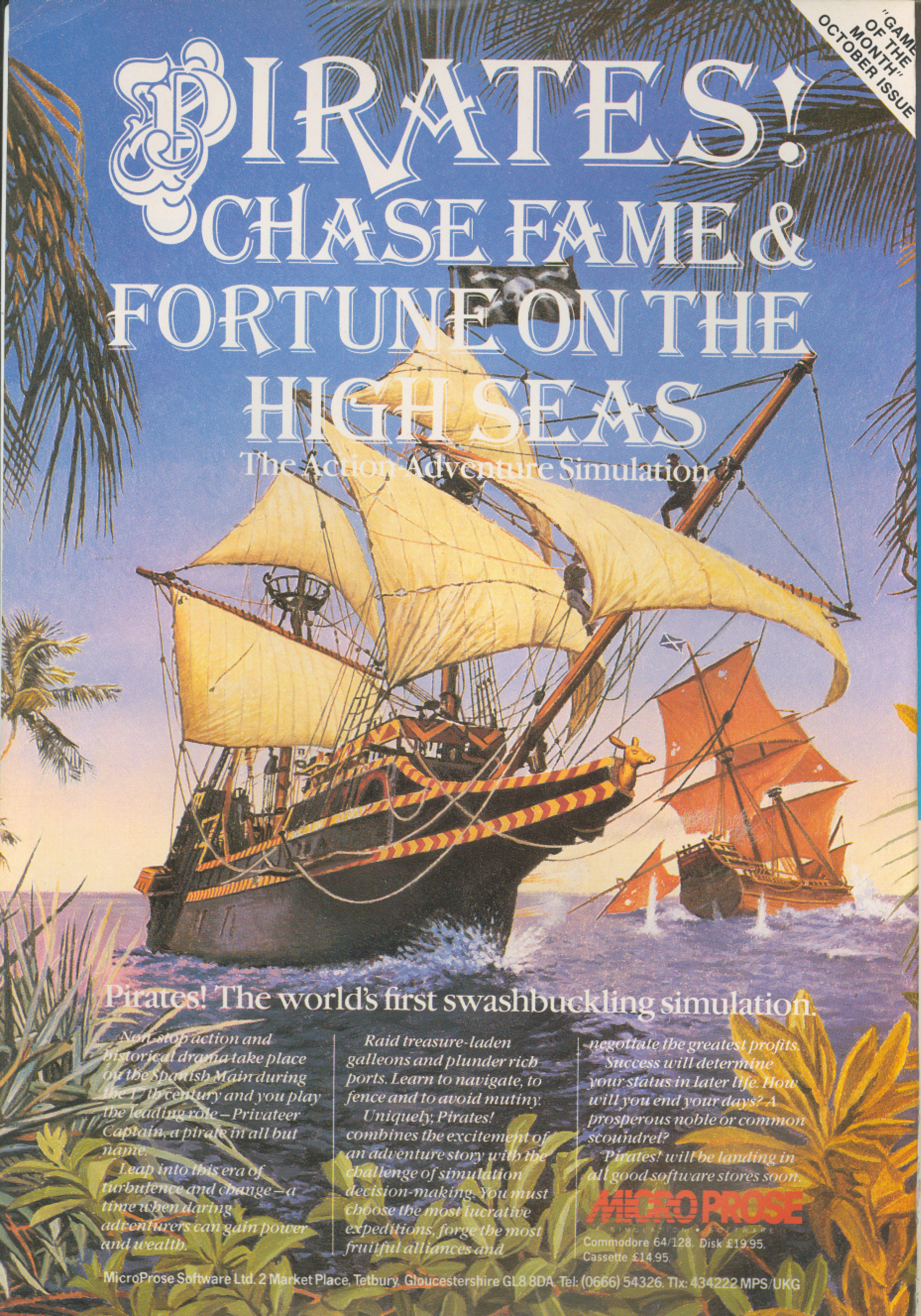
YOUR
COMMODORE
AN ARGUS SPECIALIST PUBLICATION
November 1987 £1.20



● LOGOTRON 1295 – WORDPROCESSOR, DATABASE AND SPREAD-SHEET REVIEWED ● DISK MENUS FOR PLUS/4 OWNERS ● KERNAL II – NEW OPERATING SYSTEM FOR THE C64


"GAME OF THE MONTH" OCTOBER ISSUE
PIRATES!
CHASE FAME & FORTUNE ON THE HIGH SEAS
The Action-Adventure Simulation
Pirates! The world's first swashbuckling simulation.
Non-stop action and historical drama take place on the Spanish Main during the 17th century and you play the leading role – Privateer Captain, a pirate in all but name.
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Raid treasure-laden galleons and plunder rich ports. Learn to navigate, to fence and to avoid mutiny.
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Success will determine your status in later life. How will you end your days? A prosperous noble or common scoundrel?
Pirates! will be landing in all good software stores soon.
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Commodore 64/128. Disk £19.95. Cassette £14.95.
MicroProse Software Ltd. 2 Market Place, Tetbury, Gloucestershire GL8 8DA. Tel: (0666) 54326. Tlx: 434222 MPS/UKG

Mini Office II

6 powerful home and business programs in just ONE package – at a price that simply can't be matched!



It's a brilliant introduction to business computing. The only fault I can find is that it's just too generous for the price – Database could have sold it for a lot more. It makes some of its over-priced competitors hang their heads in shame.
– *Commodore User*

Outstanding value for money . . . If you want to use your 64 as a highly efficient office machine, Mini Office certainly gives you the power you need.
– *CCI*

'This package is incredible value'
– *Daily Mail Home Computing Guide*

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Design the layout of a label with the easy-to-use editor, select label size and sheet format, read in database files, print out in any quantity – and more!

DATABASE SOFTWARE Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY

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Please send me Mini Office II for the Commodore 64/128

☐ £16.95 cassette
☐ £19.95 5¼" disc

I enclose cheque made payable to Database Software, or debit my Access/Visa card:

☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

Exp. date ☐

Signed ....

Name ....

Address ....

....

....

ORDER HOTLINE: TEL: 061-480 0171

SEND TO: Database Software, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

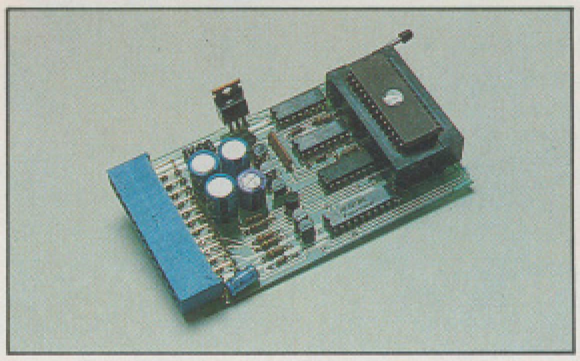
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VOLUME 4

NUMBER 2

ARGUS PRESS GROUP

ABC

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DATA STATEMENTS

Prepare for the Cold with U.S. Gold

Dare I say it, but Christmas is not far away and U.S. Gold have come up with an impressive preview list once again.

Charlie Chaplin enables you to become a silent movie director and produce the world's greatest slapstick comedian in an epic production. Choose your script, get your props together and you're ready for ACTION. A scene comprises of an adventure, and if you like it, you can go onto the next scene. The real test however is the audience reaction to the final version, which in the long run will govern your earnings – so it better be good! Available on the C64.

Following the success of *Infiltrator, Infiltrator II – The Next Day* is new in the pipeline. Jimbo-Baby embarks on three entirely new missions to save the world from the clutches of Mad Leader. The missions include neutralising a deadly nerve gas compound, deactivation of the enemy's supply of dastardly neutron bombs and a final desperate confrontation with the Mad Leader himself.

Infiltrator II will be available on C64 priced at £4.99 (ca) and £9.99 (disk) or including *Infiltrator I* for £9.99 (ca) and £14.99 (disk).

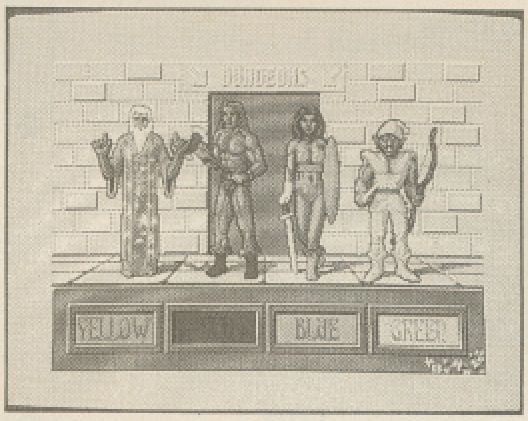
For all you *Gauntlet* fans, prepare yourself for *Gauntlet II*. Choose your original *Gauntlet* character and come up against new creatures such as the fire-breathing dragon and the IT creature.

Fight you way through the complex mazes, keeping an eye out for stun tiles and acid puddles! Do not despair, *Gauntlet II* does have some new features to help you with your crusade!

Gauntlet II will be available for the C64.

Other releases being prepared for the Christmas period are *Rygar, Indiana Jones, 720°* and *Outrun*. It looks as if a good Christmas will be had by all!

Touchline:
U.S. Gold Ltd *Unit 2/3 Holford Way, Holford, Birmingham B6 7AX.* ***Tel:*** *021-356 3388.*





Infiltrator II and Gauntlet II coming soon

Budget Bonanza

Following the success of the Silver budget range. Firebird are releasing a new budget label. Priced at £2.99, this range will be aimed at the user who is looking for a slightly more up-market product but which is still good value.

The blobpods are back in *Hyber Blob* on the C64. Help the blobpods across fragile areas of blocks – but beware, as the blocks can break or burn the blobpods feet, and whatever you do – don't let them fall through the gaps!

Vbiks Music is a polyphonic sequencer which draws all the best features from the C64 SID processor. Access all waveform modulation features on the three inbuilt channels and the fourth channel will allow you to include digitised sounds.

Touchline:
Firebird Software: *First Floor, 64-67 New Oxford Street, London WC1A 1PS.* ***Tel:*** *01-379 6755.*

Rack-It is the new budget range from Hewson with games ranging from mind-taxing puzzlers to arm-aching shoot-em-ups. The games will sell for £2.99 with an overall theme of black and white, with great graphics.

Draughts Genius will appeal to those seeking an intellectual challenge, and adventures such as *Rex Horde* and *Herobotix* for the middle of the road players. Last but not least, *Powerama* and *Anarchy* will appel to all those who enjoy a good shoot-em-up!

The games will be available on the C64 and will be priced at £2.99 each.

Touchline:
Hewson: *56b Milton Trading Estate, Milton, Abingdon, Oxon OX14 4RX.* ***Tel:*** *0235 832939.*

DATA STATEMENTS



Commodores latest signings

Shooting for the Top

Commodore UK Ltd's advertising strategy is underway with the co-operation of a few lads – the Chelsea Football team to be precise! Yes – for the next three years the team will sport(!) the revamped shirts bearing the Commodore logo, which will also be displayed around the home ground perimeter boards.

The biggest deal in British football to date was finalised with the presentation of a cheque for £1,250,000 to the Chelsea Football club.

Commodore and Chelsea respectively are aiming for the top and both feel they can climb the ladder to success together. There's more than the 'C's and their colours which bind them together. As well as the advertising, Commodore dealers will be able to take advantage to the tie-up through various promotional options.

Commodore have a history of sporting links following their German sponsorship of Bayern Munich and Dynamo Kiev and the backing of the first professional cyling tour of Britain.

Touchline:

Commodore Business Machines (UK) Ltd: *Commodore House, The Switchback, Gardner Road, Maidenhead, Berks SL6 7XA.* ***Tel:*** *0628 770088.*



Join the Club

The only requirement for free membership to the Cheetah Club is to own one of Cheetah's products. All members can then keep up to date with regular news bulletins, special offers and product discounts. If you own a product simply write to the following address for an application form.

Touchline:

Cheetah Marketing Ltd: *Norbury House, Norbury Road, Fairwater, Cardiff CF5 3AS.* ***Tel:*** *0222 555525.*

Beat the Brains

Ever dreamed of reconstructing your IQ – well, now is your chance in *Pir²* – a recent release from Mind Games. The problems arise when you play the part of Professor Storm – the Goemetric Genius, and suddenly you discover you haven't a single mathematical formula in your brain! Work your way around the cogs and wheels that connect the memory bubbles containing the formula you need. Can you prevent the good professor from becoming a moron – there's only one way to find out! Available on the C64, priced at £8.95 (ca) and £12.95 (disk).

Touchline:

Mind Games (ASP Software Group), *Victory House, Leicester Place, London WC2H 7NB.* ***Tel:*** *01-439 0666.*

Software for HMV

A games software department is to be opened in HMV Music Stores aiming to hold the largest range of software in Oxford Street, London.

Andrew Tait, HMV's software expert comments, 'we will be mass merchandising all new releases with discounts on selected new titles. As well as this our customers can look forward to great in-store promotions and competitions'.

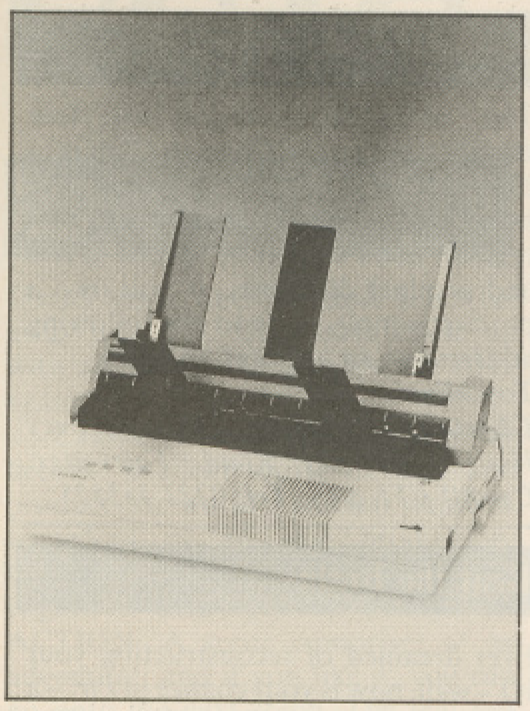
So, when you're browsing for your latest LP's at 363 Oxford Street, remember you can get your computer software there as well.

Touchline:

Lynne Franks Ltd: *6-10 Frederick Close, Stanhope Place, London W2 2HD.* ***Tel:*** *01-724 6777.*

HMV take Software

DATA STATEMENTS



Brother 1724

The latest on the Hardware Front

Robtek has recently acquired the rights to the Terminator joystick from the Denmark based company Supersoft. Robtek will be covering the UK and Germany, and sales director, Mike Segrue commented, 'we are looking to achieve very high sales on what is an excellent and very novel product. The Terminator costs £19.95

In a bid to produce quality disks at low prices, Mydisk Ltd has produced a range, with prices starting at £7.99 for a box of thirteen. Managing Director Simon Kelly promises, 'if a customer can find branded disks of the same quality at a cheaper price, then Mydisk will refund the difference'. Each disk has a clipping level of 65% and comes with a 'two for one' guarantee, i.e., a faulty disk will immediately be replaced with two.

Brother has recently produced the 1724 – a letter quality dot matrix printer which will sell for £695. The 24 pin 1724 operates at 216 characters per second in draft and offers fast letter quality printing at 72 cps. The 1724 is compatible with Epson 1000, Diablo 630 and IBM Proprinter XL, and a dual interface, Centronics and RS232, is available. John Carter, Sales and Marketing Manager for Brother comments, 'the introduction of the 1724 extends our selection and supplements the 2024L in our 24 pin range'.

Touchline:

Robtek Ltd: *Unit 4, Isleworth Business Complex, St. Johns Road, Isleworth, Middx, TW7 6NL.* ***Tel:*** *01-847 4457.*

Mydisk Ltd: *Farley Hall, London Road, Binfield, Bracknell, Berkshire RG12 5EU.* ***Tel:*** *0344 863680.*

Brother Computer Peripherals Division: *Jones & Brother, Shepley Street, Guide Bridge, Audenshaw, Manchester M34 5JD.* ***Tel:*** *061-330 6531.*

Strategy and Adventure

PSS have recently launched a new series of strategy games – with *Classic Conflicts.* Three of the titles are relaunches of the Classic PSS titles – *Theatre Europe, Battle for Midway* and *Battle of Britain.* Another title in the pipeline is *Power Struggle* which is a game of world domination.

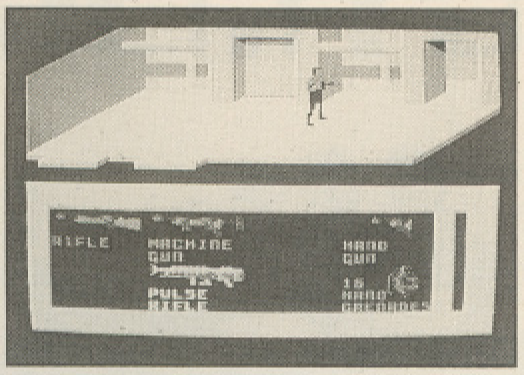
Classic Conflicts is available on C64, and will be priced at £4.99 (ca and disk).



Battle of Britain

CRL's follow-up to *Cyborg* is in the form of *Mandroid.* You are Cyborg and your mission is to retrieve the stolen blue prints and so they can be used for the good of mankind. This is a world of bandits, prostitutes, drunkards – a world of debauchery. However the longer you take to retrieve the blue prints the more Mandroids are put into production and you must discover how these complex machines are de-activated and ultimately find your way through the complex labyrinth to the safe which holds the vital information.

Mandroid is available on the C64, and will retail at £9.95 (ca) and £14.95 (disk).



Mandroid

Martech are putting the finishing touches on their racing game – *Nigel Mansell's Grand Prix*, and so all you budding drivers – be prepared. As the driver, you have access to the latest in car design and technology. Whether you simply want to blast around the track at excessive speeds with the turbo on maximum boost without a care in the world or whether you want to race a selection of the world's greatest circuits, this game is for those who enjoy the excitement of speed.

Nigel Mansell's Grand Prix will be available on the C64.

Airborne Ranger is a recent release from MicroProse and is an action simulation with 12 desperate missions in three different regions of the world. Tactical thinking and lightning reactions will win the day. *Airborne Ranger* will be available on C64/128, priced at £14.95 (ca) and £19.95 (disk).

A second MicroProse release comes in the form of *Stealth Fighter* – simulation of a radar elusive jet fighter believed to be testing as part of the US Air Force arsenal.

Stealth Fighter will be available on C64/128, priced at £14.95 (ca) and £19.95 (disk).

Touchlines:

PSS: *452 Stoney Stanton Road, Coventry CV6 5DG.* ***Tel:*** *0203 667556*

CRL: *CRL House, 9 Kings Yard, Carpenter's Road, London E15 2HD.* ***Tel:*** *01-533 2918.*

Martech: *Martech House, Bay Terrace, Pevensey Bay, East Sussex, BN24 6EE.* ***Tel:*** *0323 768456.*

Microprose: *2 Market Place, Tetbury, Gloucestershire GL8 8DA.* ***Tel:*** *0666 54326.*

Business Bargains

Is Logotron's trio of business programmes a portfolio for success?

By Eric Doyle

Logotron has steadily built up a solid reputation through producing software for the BBC micro. Even C64 owners may have heard about XOR, the game that took the BBC fraternity by storm. Soon all C64 owners will have heard of Logotron when they enter the C64 market with their new 1295 business software range.

There are three packages in the set: a wordprocessor, a simple database and a spreadsheet. Nothing technically revolutionary except where cost is concerned.

Wordprocessing

Logotron Write 1295 is a sophisticated word processor with built-in spelling checker and mail merge facilities. It is simple to use, but there are one or two tasks which must be performed when you first use it.

The newly loaded program presents the user with a horizontal menu offering six categories: edit, option, print, storage, setup and quit. Selecting any of the categories will open up a sub-menu window showing the full range of options.

It is best to select the *setup* feature first because, as the sub-menu reveals, you have the opportunity to insert up to seven codes which allow you to access some of the special features your printer may possess. You can also select ASCII or non-ASCII (normal Commodore) output, the inclusion of extra linefeeds or a specific device number and secondary address.

Under the sub-heading of *setup storage*, dual disk drive operation can be selected and a further heading allows the screen display colours to be changed. When all is as you would wish it to be, the fourth option allows you to save the parameters to disk to be automatically loaded each time you use the Writer.

Option opens up the possibilities of search and replace, preview and spelling check.

Search merely finds every occurrence of a specified word in the text. *Search* and *replace* not only finds the word but also replaces it with a new word of any length which you have selected.

Because the screen is only 40 characters wide and most printers work to an 80 column width, the preview option is essential. The formatted pages of your document appear just as they will on the printout. This gives you time to make those small changes which always seem necessary before you commit your work to paper.

It's a good idea to check your document for spelling mistakes before printing. This is a good option to have and surprising on such a low cost product. Unfortunately this option has a weak point: the given dictionary is fixed; you can't add or subtract words to cater for your specific needs.

Since the spelling checker only checks the words which it knows, 'catalogue' spelled in the American way (without the 'ue') will remain undetected because the word is not included in the dictionary's 1000 word database. All this apart, the spelling checker does work given this small limitation.

Storage allows disk access for loading and saving files, sending disk commands to erase old documents or to format a whole disk. The loading process is further simplified by the inclusion of a directory facility which lists all of the document files onto the screen. From the list you can load the file that you want by highlighting the required document name.

The next menu option is *print* which is not only for accessing the printer but is also for sending the current file to disk as an ASCII file. Here the special mail merge facility can be called, but more of that later.

Edit releases you from the menu so

that you can create a document and *quit* merely resets the computer to Basic.

Such are the facilities offered by this program that I've not yet mentioned the cut 'n' paste or the special feature menu. Basically the cut 'n' paste menu allows the user to move text around either replacing, replicating or erasing selected blocks. Regularly used sections such as copyright clauses or letter heads can even be merged in from disk.

Special features allow all of the special printer functions which have been defined previously. These can include underlining, boldface text, compressed text or expanded text. In addition right justification, headers and footers, page format, tab settings or centering can all be set. It is also possible to append files forming a chain of files should you be embarking on a novel or similarly long document.

The merge function works in conjunction with the Filer 1295 program. Fields may be selected from a file for insertion in documents. For example, if you are embarking upon an advertising mailshot to several companies, a standard letter is created and merge marks included where each company's address will appear. At print time the File database disk is placed in the drive. Each time the letter is printed a new address is pulled in from the disk and printed wherever indicated.

The text memory boasts about 19K of space. In real terms this means 19,000 characters, or approximately 3,500 words, or just under 500 lines making this a valuable wordprocessor for any user.

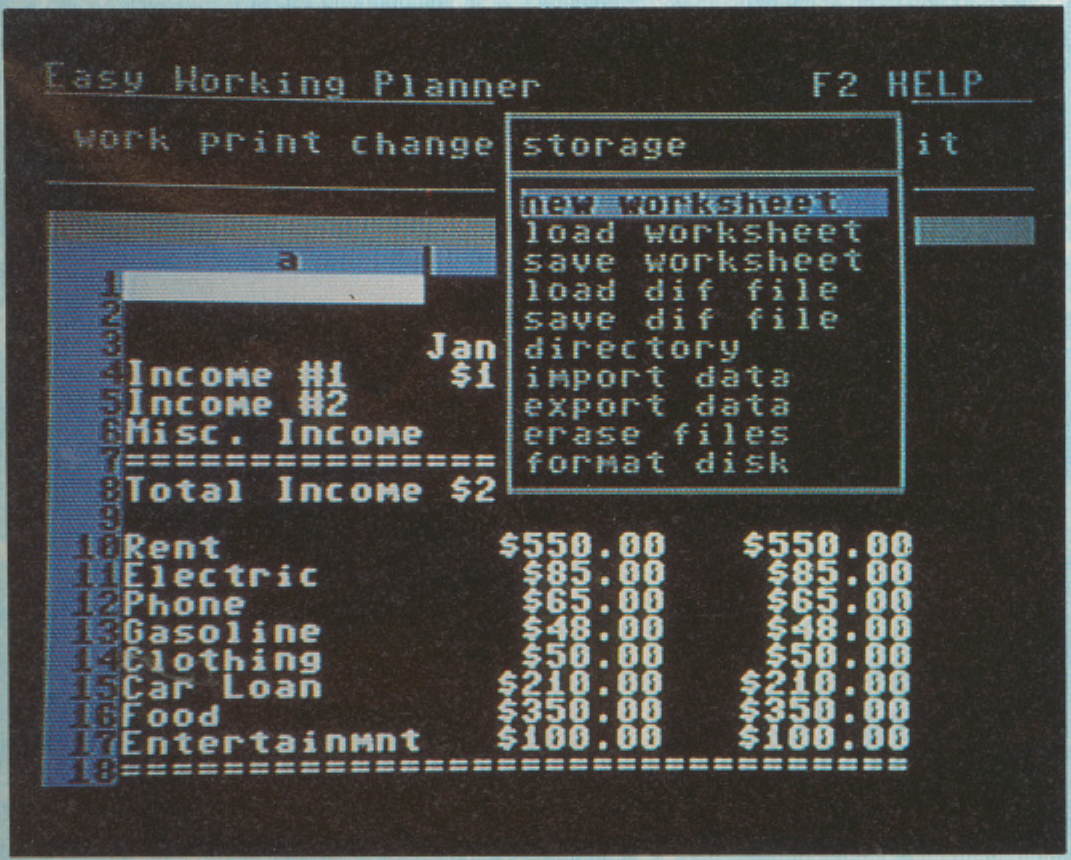
The Database

Filer 1295 is a simple database which is both friendly and cheap. The hard part is inputting all of the data which you want to store.

Each Filer database occupies a single disk so the maximum number of records is limited by the simple equation of free disk memory divided by the number of bytes which each record is allocated. The fewer the number of fields in a record, the greater the number of records per database.

In case I'm losing you at this point, let me explain filespeak. A *database* is a catalogue of grouped information. Usually the groups are individual and company names which, like entries in an address book contain various other details such as addresses, phone numbers etc.

In such a database a *record* would consist of all of the information referring to one particular company or individual. *Fields* are the individual entries which make up a record such as name, address, phone number etc.



One of the fields can be designated as the key field. This is the name under which the record will be entered and usually consists of the name of the company or the surname of an individual.

What is kept in a database is entirely up to the user when the record fields are defined. Filer 1295 has several field types to help in maximising the memory efficiency of the system. With only 250 bytes allowed per page, memory is at a premium. Using the full allowance of 25 characters per field, a disk will hold 288 records. Fields can fall into one of four types: keyfield, alphanumeric, numeric or data.

Once you've carefully entered all the records in your database, changes and deletions can be made or, free space permitting, further deletions can be made.

What you end up with is a very useful file which can be used in various ways. Files can be selected and saved according to criteria selected by your own needs. For example, if you want to separate out all of the people who live in the Leeds area, own a C64 and a car, you simply set these criteria and let the computer do the rest. If you then want to print out selected information from the database, such as name and address for labels, this can be achieved by generating a report sheet.

Within the limitations of ten fields, each holding 25 characters, quite a lot can be done but a lot of though has to be applied first.

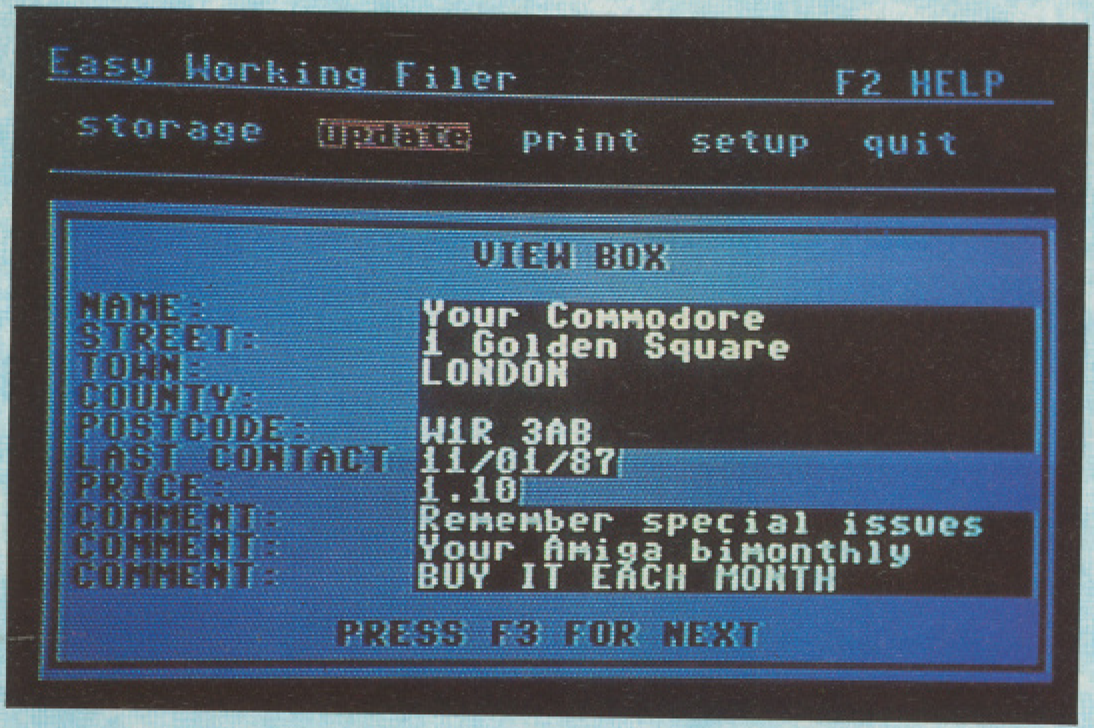
To maximise memory use you can use a coding system like binary for one of the fields. If someone complies with a particular criterion then a one is recorded, if not a zero is used. The result would be a number such as 1101 which could mean that the person in question is married, male, childless but car owning. To find other married car owners you could then specify a match to equal 1??1. The question marks mean that any character will be accepted for sex and parenthood, but only a positive indicator for marital status and car ownership will be accpeted.

If you just want a list of married people you can ask the computer to find a match for 1*. This means that the first figure has to be a one, but the other figures can be anything.

Using a master chart these codes can be converted into real terms and

you're not limited to mere ones and zeros. If someone has two cars why not record the fact with a figure two?

Filer 1295 may be a humble database but for most people it is powerful enough if used sensibly.



The Spreadsheet

Planner 1295 is probably the most powerful spreadsheet available at this price range.

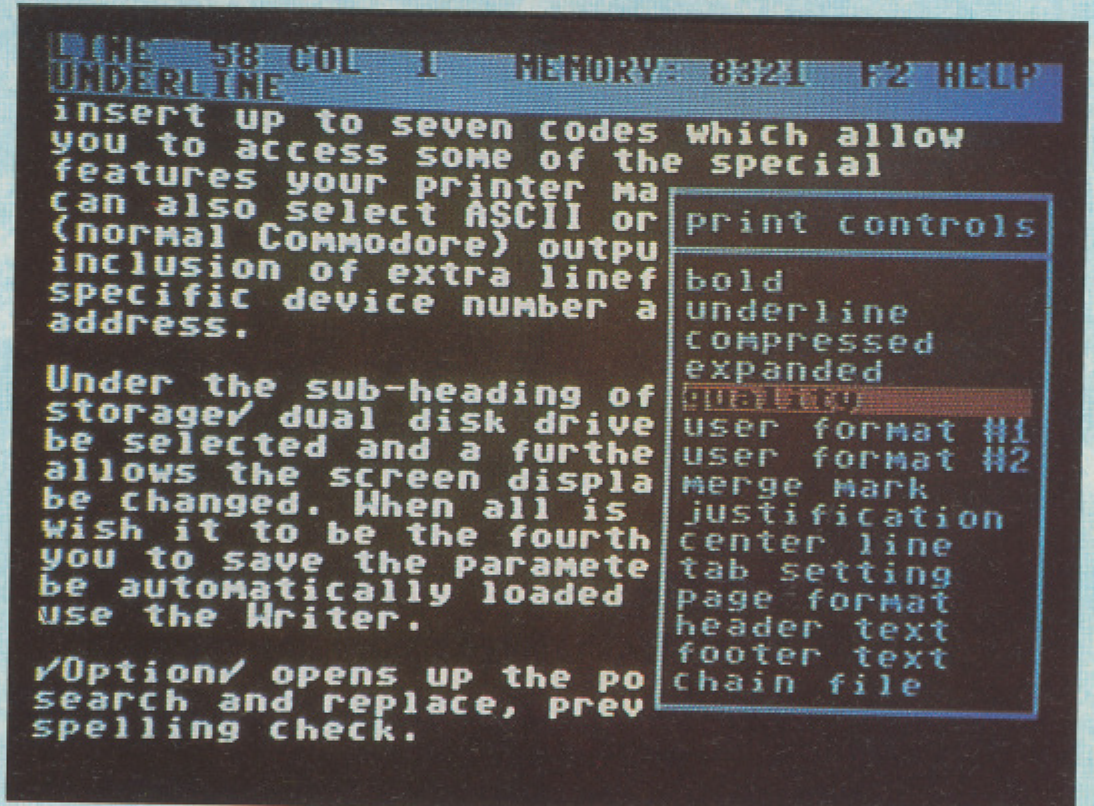
Starting with a fairly basic sheet of incomings and outgoings, the Planner will grow in complexity as your finances become more involved. Insertion and deletion of columns and rows is easily achieved, as is cutting and pasting whole sections for transplanting to another part of the sheet or across to another sheet completely.

The advantage of these facilities is that detailed planning of the layout of your sheet is not essential. As long as you are somewhere near to your requirements, corrections can be made later.

The size of the sheet depends on the complexity of its contents. Columns can be set to any width from three characters up to a maximum of 37. Using a column width of 12, I still had about 7K of memory left when I created a 26x44 matrix!

Definition of cell contents is simplicity itself. If you want it for text just type in the letters; if it is to be a fixed value, type it in; for a formula type an equals sign first. Calculations can be extremely complex using all mathematical operators plus a few specially defined functions for dealing with group of cells. Using these commands the sum, difference or average of a group of cells can be calculated, and the maximum and minimum values can be found. The range is staggering.

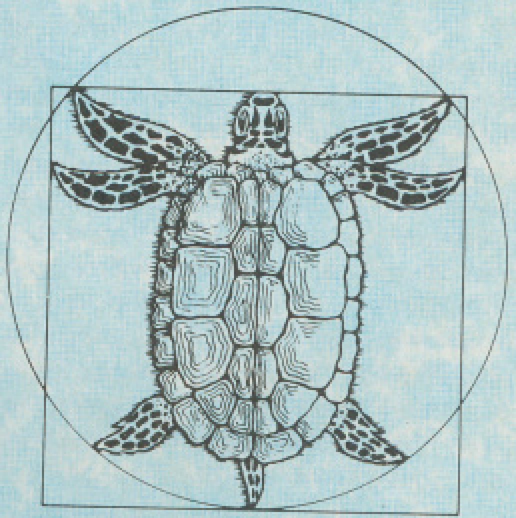
Printing out the finished sheet has the usual limitations of paper width. If the spreadsheet is more than 80 characters wide, it is possible to select different areas of the sheet, print them out and then use sticky tape to recreate the full spread.



Conclusion

Logotron has three excellent products which were tailored for the British market from an American program created by Spinnaker Software. Planner 1295 is particularly comprehensive and writer 1295 is more than adequate for most people's needs. Even the weakest module, Filer, is powerful enough to be considered for small business uses. It is rare that a suite of programmes prove quite as satisfactory as this trio – perhaps they could become the Lotus 1-2-3 of the C64 world!

Touchline:
Software: *Wordprocessor, Spreadsheet, Database.* ***Prices:*** *£12.95 each.*
Supplier: *Logotron Ltd, Dales Brewery, Gwydir Street, Cambridge CB1 2LJ.*
Tel: *0223 323656.*



Kernal II

Add easy file handling and much more with this pull down menu system.

By Patrick Chable

The Commodore 64 may be a great computer but no one will deny that its file handling could be greatly improved. After all, if you need to get a directory on a normal C64 you have to erase the program that is currently in memory.

Kernal II will patch itself into the C64s operating system and provide you with a series of menus that will greatly improve the ease of which you can LOAD, SAVE and find details on programmes.

When the program is in use, an arrow is resident on the computers display. This arrow can be moved around the screen with a joystick in port 2. Across the top of the screen a strip is displayed giving the titles of the pull down menus available. These are, DISK, TAPE AND OPTIONS. To activate the menu you must position the pointer over the option and press the fire button. All of the commands available under that heading will appear. To select one, move the pointer to the command that you require and press fire.

All commands, having carried out their work, display an OK prompt. Just place the pointer on this, press fire, and the machine will return to the program that was running before the command was executed.

As well as offering pull down menus the operation of a few keys is altered by the program. Pressing F1 stops the computer and F3 restarts it. This allows you to stop a Basic listing or a directory listing. The RUN/STOP and RESTORE keys will not perform a warm reset as normal.

Below you will find a list of all of the functions available from the program.

Disk Menu

SAVE – this routine allows you to SAVE a program or a block of memory. The computer asks you for the file name. Type this in on the keyboard in the normal way, delete mistakes with the DEL key. KERNAL II will not allow you to enter a name with more than 16 characters. If you try to enter more the program will automatically jump to the next SAVE option. If you don't need a program name as long as 16 characters you can press RETURN once you have entered the desired number of letters.

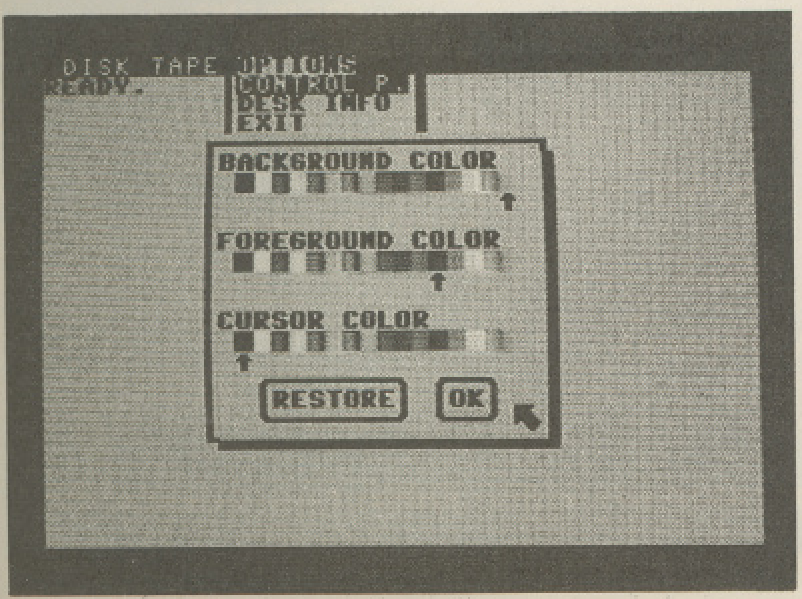
Once you have entered the program name a second pull down menu will be displayed. First you are asked whether the program is BASIC or ELSE. Move the arrow and press fire to select the desired option. BASIC means that the program to be SAVEd is Basic and will be SAVEd in the normal way.

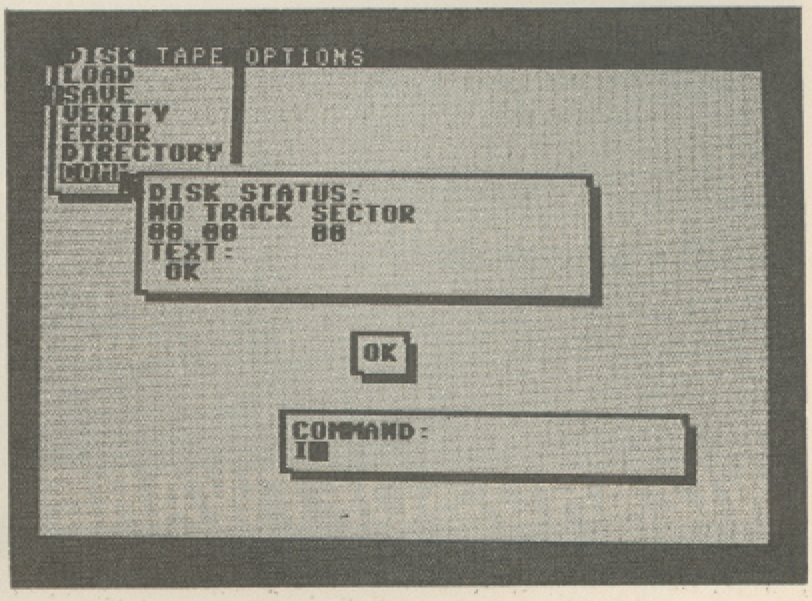
If ELSE is selected then you are allowed to SAVE machine code. You are prompted for the start and end address of the code to be SAVEd, in hex. These numbers must be four digits in length, i.e. 80 becomes 0080. This program could be SAVEd with this option. The start address is 8000 and the end address is 92B0.

LOAD – this works in the same way as SAVE. If ELSE is selected for the program type then you are just prompted for the address where you want the LOAD to start. N.B. Basic programmes are LOADed into the computer as though you had entered LOAD "name",8,1.

VERIFY – this will verify the specified program on disk.

ERROR – this command reads and displays the error status of the disk drive.





COMMAND – the normal disk commands, e.g. I,N,S etc. can be entered here.
DIRECTORY – this routine will display all files that are on the disk, even deleted files are displayed. You can pause the listing with F1 as detailed earlier. RUN/STOP will stop the listing and exit with an OK. N.B. It may be necessary to initialise a disk with the I0 command before displaying a directory.

TAPE MENU

SAVE, LOAD and VERIFY options are identical to those for disk, but operate with the tape deck.

OPTIONS MENU

CONTROL PANEL – this routine will allow you to change the colours of the border, screen and text. When you leave this with an OK the colours are set in memory. Using the RUN/STOP and RESTORE keys, or the restore, option will return the screen to these colours.
EXIT – this command returns the computer to its normal state, without KERNAL II. You can start the program again with:
POKE 32772,195

followed by:

SYS 64738

Kernal II uses files 15,1 and channels 15,1 so take care not to use these in your own programmes. The program is stored in memory from $8000 to $92BD. It also uses memory in the $C000 to $A000 region. Since this program patches into the operating system it is extremely unlikely that it will work with commercial software.

Getting it all in

The program is presented here as a Basic Loader that POKEs all of the machine code into memory. Use the SYNTAX CHECKER program when entering the program to help with your typing, see LISTINGS page.

Once the program is in memory you can SAVE a working version of the program using the SAVE, ELSE commands within the program and specifying a start and end address as detailed within the article.

The machine code version of the program SAVEd in this way will obviously LOAD much faster than the Basic version. To use this program you should type:

LOAD "name",8,1 for disk or
LOAD "name",1,1 for tape.

Once the program has LOADed enter SYS 64738 to start it.

See Listings on page 113 YC

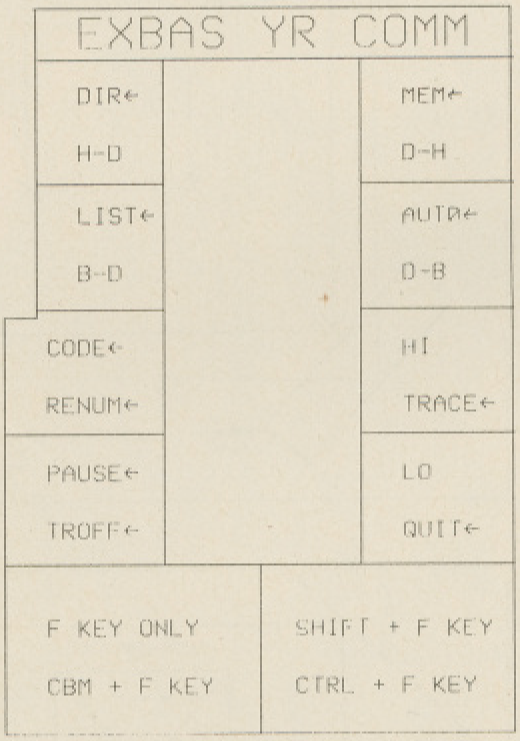
Function Key Template

It is not easy remembering all the functions of the C64 Keyboard. A program using the C64 and 1520 printer/plotter can solve the problem by producing a template.

By John Allison

The Commodore 64 keyboard has only four function keys, but each one can be used in four ways. The function keys can be pressed on their own or in conjunction with the SHIFT, CBM (the key with the Commodore symbol on it) or CTRL keys. This gives up to sixteen key definitions. In the Extended Basic program given away on tape with the November 1986 issue of *Your Commodore* all sixteen function keys can be programmed.

This can make program development much simpler and easier, especially as the keys can be easily re-defined by the programmer. However, there is a small problem. When you have defined the keys and are merrily typing away and want to use one of the function keys to save time and trouble, you cannot remember which key gives the proper result! Was it 15 or 16? And is it CTRL and function 7 or is is CBM and function key 7? If you have a Commodore 1520 printer/plotter, as well as a 64 computer, this program will solve these dilemmas. It will produce a template which can be fitted over the keyboard around the function keys. The template will remind the user of each function key definition and which key combination to press to obtain it.



Commodore 64 Function Key List

The C64's sixteen functions can be obtained, providing that they have been previously defined, by pressing the key (or key combination) listed below:

Function

1 = F1 key only
2 = SHIFT key + F1 key
3 = F3 key only
4 = SHIFT key + key
5 = F5 key only
6 = SHIFT key + F5 key
7 = F7 key only
8 = SHIFT key + F7 key
9 = CBM key + F1 key
10 = CTRL key + F1 key
11 = CBM key + F3 key
12 = CTRL key + F3 key
13 = CBM key + F5 key
14 = CTRL key + F5 key
15 = CBM key + F7 key
16 = CTRL key + F7 key

The CBM key is on the bottom row of the keyboard at the left-hand side, marked with the Commodore symbol.

Keying-In The Program

Type in the program given in the listing. Save the program to tape as "KEY TEMP". The program will automatically save to disk (device 8) if you enter GOT02 (Return) at any time while entering the listing. Type the GOT02 command as a direct command (on a clear line with no line number). Doing this regularly, for example when a screenful of lines has been entered or when having a few minutes break, will save having to retype those lines if the computer accidently loses them, or is switched off before the program is saved. Make sure that a copy of the full progam has been saved from RUNning it.

Using the Program

Before RUNning the program connect the 1520 printer/plotter to the 64 and ensure that it is loaded with paper and that the pens are loaded in the right colour order. Switch on the power supply to the printer/plotter.

Load and run the KEY TEMP program and answer the questions as

they are displayed on the screen.

The program will produce a template with sixteen function key labels but usually only eight are needed, which the program allows for. Any label can be left blank by just pressing (Return) when the label name is asked for. Do not use punctuation marks (commas, full-stops, etc.) and when some graphics characters are not printed properly on the 1520, consult the 1520 User's Manual for more information. The backarrow can be used, and I use it to denote that the function key command includes a (RETURN). Confirmation of the label name is required to avoid wasting time and paper. The label descriptions are also displayed just before printing starts to reduce the risk of printing a wrong template.

> "The template will remind the user of each function key definitio and which key combination to press to obtain it."

Fitting the Template

The paper used in the 1520 is very thin and not satisfactory to use on its own as a key template. To remedy this it should be backed with a piece of stiff card. The surface of the template can be laminated with transparent film to protect the surface from dirt, fingermarks, etc.

Back the template, before it is trimmed to size by fixing it to a piece of card and prick the corners with the point of a pair of compasses or something similar as shown in Figure 1. Remove the template and mark the lines joining the holes in the card made with the compass point. Cut the card with a sharp knife in the shape of the template along the marked out lines. Check that the card fits on the keyboard and that there is sufficient clearance for it not to interfere with the operation of the keys. Trim the edges as necessary.

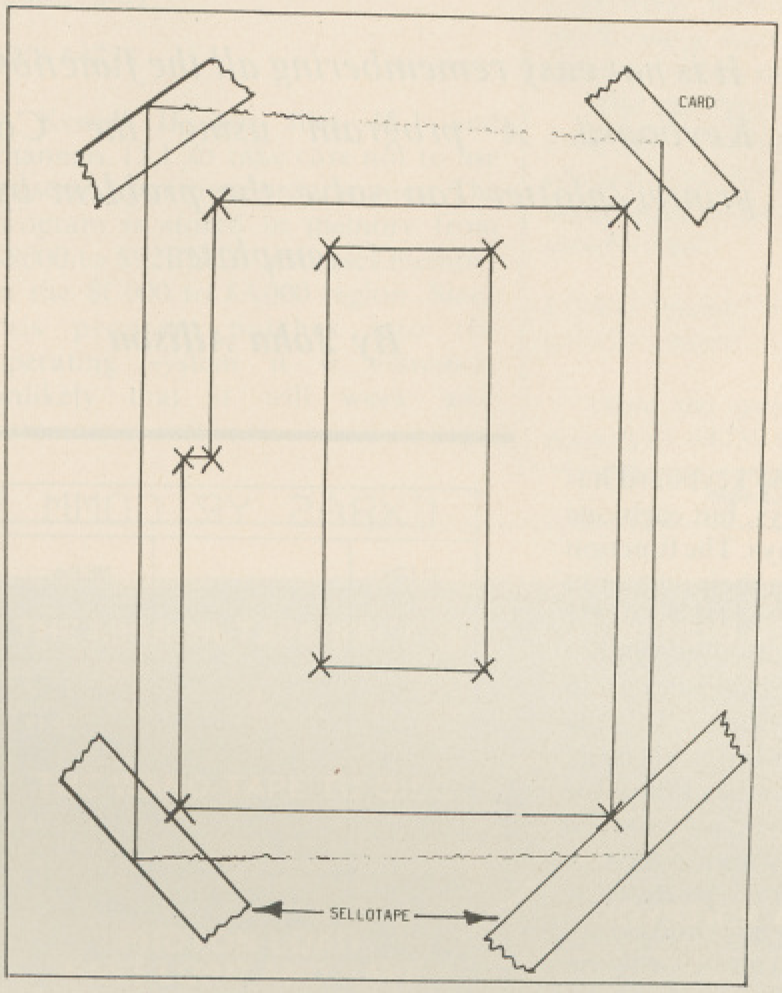
Cut the outside of the paper template and on the inside cut out leave 1/8th of an inch inside the lines, making a diagonal cut into the corners.

Cut a rectangle of transparent film (I recommend Transpaseal which is available from W.H. Smiths) about 1" wider and 2" longer than the template. Peel the backing off the film and lay the film sticky-side upwards on a flat surface. Carefully lay the paper template — print-side downwards — on the film. Cut the corners of the film as shown in Figure 2.

Position the cut-to-shape card accurately over the paper template and fold the edges of the film over and press on to the back of the card. Next fold the film in the centre cut out. This will hold the paper template securely to the card.

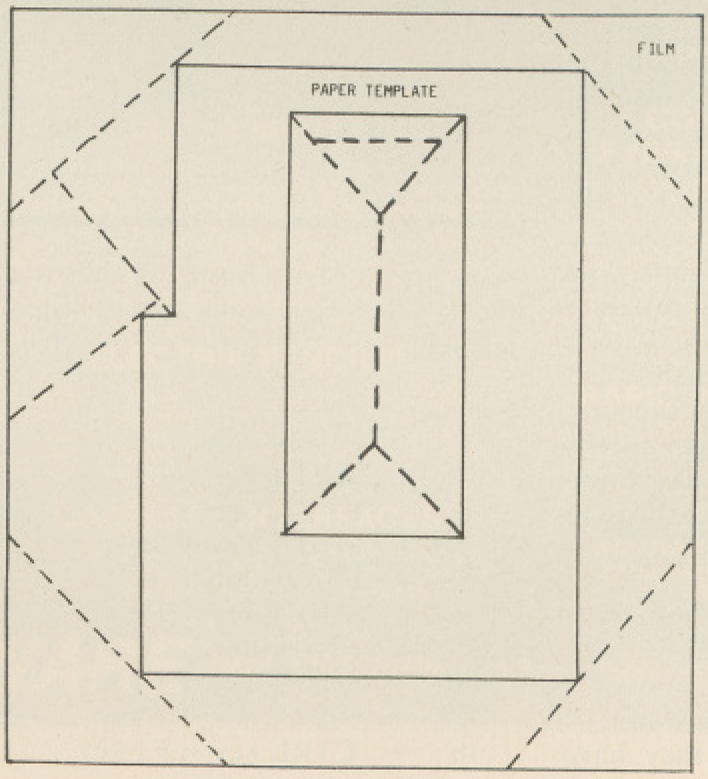
Finally, fit the template to the keyboard and hey presto — no more relying on the grey matter!

See Listings on page 122



Prick through points marked 'X'

FIGURE ONE



Cut the laminating film along the dashed lines.

FIGURE TWO

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Sci-Fi Games

Zap into the future with this selection of high-tech games from Electronic Arts.

By Tony Hetherington

Space, the final frontier. These are the games that can take you into the unknown as you fight, trade or explore your way across the galaxy. These games cover the whole spectrum of computer gaming from the coin-op conversions of Nemesis and Quartet, to the adventures of Silicon Dreams and the Hitch Hikers Guide and the strategy of stopping the Ogre or surviving in the Autoduel arena.

The Hitch-Hikers Guide to the Galaxy was originally a radio series, then a TV series and a play and several books until finally, thanks to Infocom, an adventure. The result is probably the best adventure you will every play. It will certainly be the funniest as it combines the humour of Douglas Adams with the usual blend of fiendishly difficult but so obvious (when you eventually solve them!) Infocom logic problems.

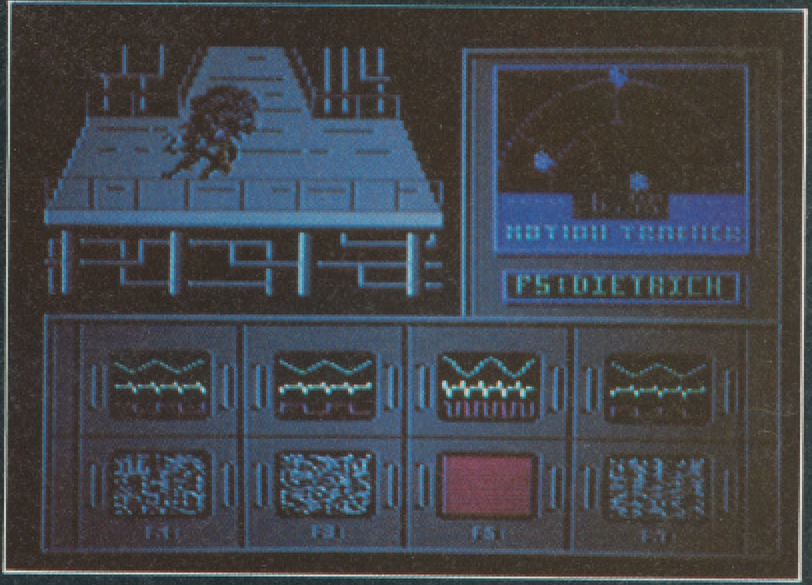


Portal

This, laugh as you suffer adventure, will have you riveted as you try to find a way past the bug blatter beast of Traal, build an improbability drive and try and get some sense out of Marvin the manic depressive robot and many other equally impossible tasks. The game is obviously based on the radio series, and associated books but has a new plot so ther're no short cuts for those players who already know where their towel is.

Explore New Frontiers

Infocom also feature a growing supply of Sci-Fi games for adventures needing to explore new frontiers. Stationfall is the sequel to the equally puzzling Planetfall in which you're a deck scrubbing Ensign 7th Class survivor, when your space cruiser crashes only to get into deeper trouble. Stationfall continues the adventure.



Aliens

Leather Goddesses of Phobos is an experience you won't forget as it's a game that you can play at three different levels ranging from tame through suggestive to lewd. Your mission is to stop the leather Goddeses fiendish plan to reduce the Earthmen to a race of sex slaves and to help you out you'll find a 3D comic to read and in the box 3D graphics to read and an intriguing scratch and sniff card! Some of the older games can still be found at incredibly low prices such as Starcross and the weird and wonderful Suspended which sets you in suspended animation and your only way to explore and save an impending disaster is by controlling six very peculiar robots.


PLANNER 1295
LOGOTRON
High-quality, low-cost personal productivity software
SPREADSHEET
£12.95
WRITER 1295
LOGOTRON
WRITER 1295
INCLUDES 100,000 WORD SPELLCHECKER
High-quality, low-cost personal productivity software
WORD PROCESSOR
£12.95
FILER 1295
LOGOTRON
FILER 1295
High-quality, low-cost personal productivity software
DATABASE
£12.95

Futuristic Graphics

On this side of the pond, only Level 9 have stemmed the Infocom tide with their own trilogy of futuristic adventures now marketed by Rainbird as Silicon Dreams. These adventures packed with illustrations and text descriptions to match, tell the tale of Kim Kimberly and his descendant who are caught up in the colonisation of the Planet Eden.

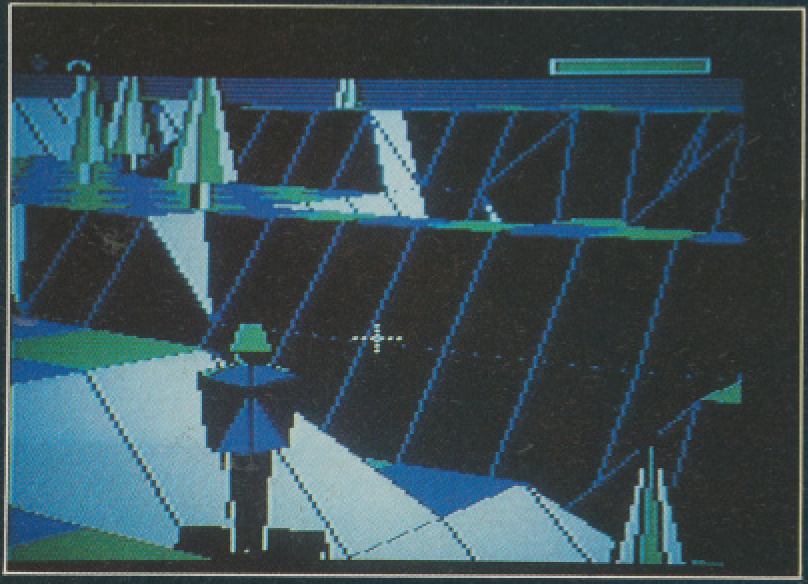
The saga begins on the colonisation ship in Snowball where you find trouble. In Return to Eden you must escape the avenging crew of the Snowball (I told you there was trouble) and find the robot city of Enoch only to find in the final part the Worm in Paradise that there is something desperately wrong with this robot serviced city. The robots have taken over!



Quartet

Activision's Portal is described as a computer novel in which you return from a failed 100 year mission to find that all the people have gone. Where? Using Homer, a biological computer, that's growing weaker and weaker you must piece together the story before it's too late.

Activision also have the distinction of being the only company to produce two different games based on the same film sequel – Aliens. The American company produced a multi-game version that follows the plot of the film with stages representing the scenes in the film where the dropship lands on the planet, the rescue attempt to free the trapped marines, you hold off hordes of aliens as the team cut their way out of the operations room, a mad scramble through the air ducts, a race against time to find and rescue newt and the final duel with the Alien queen.



Sentinel

Meanwhile, Electric Dreams (part of Activision UK) has its own version that captures the atmosphere of the film but not the actual plot. Your mission is to guide your six marines through the rooms of the Alien infested complex. The action is tense and incredibly exciting.

Covering up a Bad Game?

In that arcades the science fiction action is little more than left/right/fire games in which an unbelievable variety of aliens are destroyed by players of countless games. In fact the science fiction label is stuck onto the strangest games usually to cover up a poor game or rehash and revitalise a rewrite of an old one. For example, Archanoid is an exceptional rewrite of the original breakout but it's hardly science fiction. Two exceptions to this are Quartet and Nemesis.

Quartet is the sci-fi equivalent of Gauntlet except that it's a side on scrolling game converted by Electric Dreams in which the player selects one of the game's four characters to fight their way through the screen.

Nemesis (Konami) is one of the best coin-op conversions as well as being a top shoot-em-up where your ship and your chances of success get better as you blast the enemy until finally you have a high speed craft armed with lasers and missiles as well as two laser firing remotes.

Rainbird's Starglider is one of the few games yet to make the transition from computer to arcade as more and more players grapple with the vector graphic tanks, missile launchers stompers, walkers and flying stargliders to avenge the occupation of the planet Novenia.

Although Starglider has made the breakthrough it could have happened to any number of quality shoot-em-ups such as Novagen's Mercenary, CRL's Tau Ceti (the C64 disk version is incredible), Alligata's Trap and, of course, Elite (Firebird) and Hewson's Uridium. Elite and Uridium were games that rapidly set standards that other games had to beat (but also copied) and will always remain two of my favourite games.

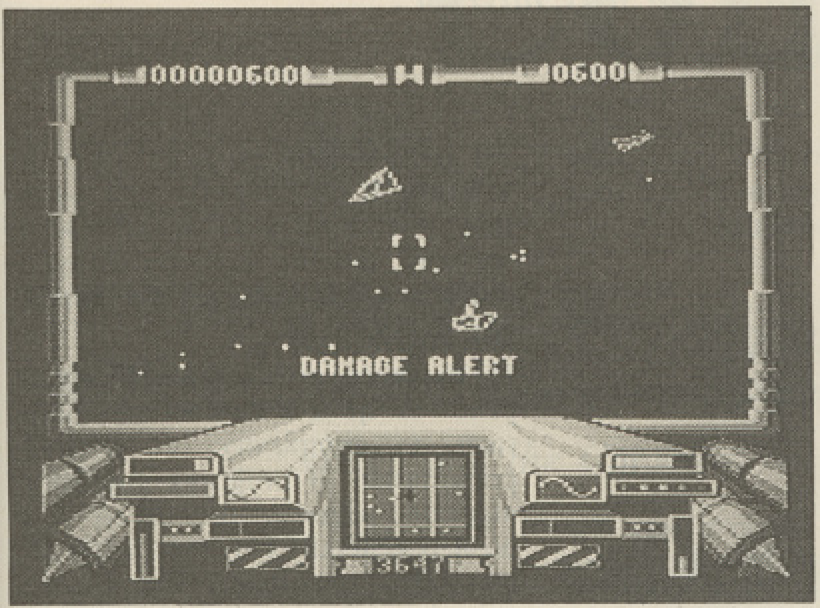
Brain Power Wins

Firebird has since followed up its elitest success with the double act of Cholo and Sentinel. Sentinel is an incredible game in which you must use your brain and your reactions to defeat the Sentinel over a staggering 10,000 battlegrounds. The Sentinel stands on top of the highest peak in each of these lands and absorbs all excess energy. Your task is to teleport from robot shell to robot shell until you can strike at the Sentinel while avoiding the Sentinel's deadly draining stare.

In Cholo you've just realised that mankind is trapped underground. The robots were supposed to let you out once the radiation levels had subsided. Now you have only one chance of escape as you've managed to regain control of a general purpose robot called Rizzo. If you use him well and don't make too many mistakes you may be able to recruit more robots to fight the rebels. Cholo is a little slow

compared to other games, but once you're into it you're hooked.

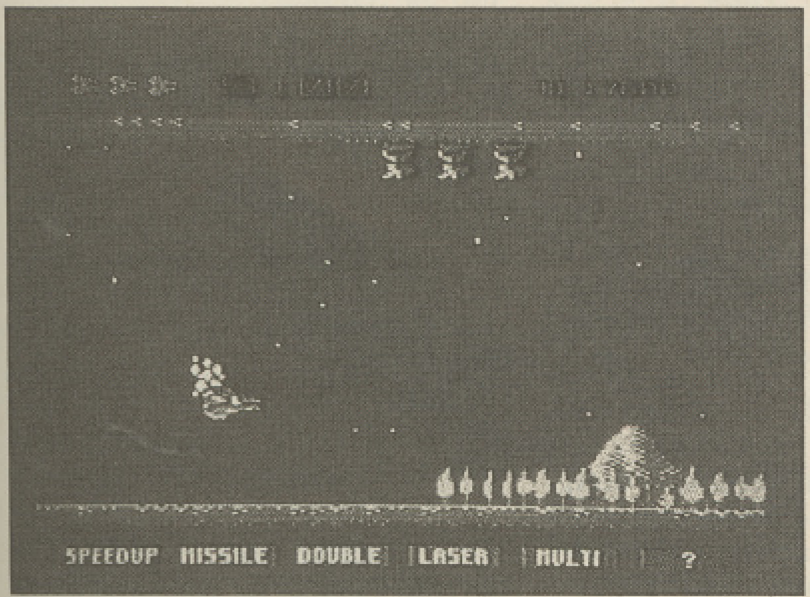
The hardest sci-fi game has got to be Accolades (imported by US Gold) Psi-5 Trading Company. The game features some impressive graphics and an easy game system. I can even cope with selecting a crew from the 30 galactic oddballs that you get to choose from but I always seem to get blown up and plundered by pirates on my first trading flight! Has anyone finished it?



Starglider

Ogre is set to be the next computerised board game to follow Autoduel and will be a strategy science fiction wargame between two sides. One side must defend a command post with a force of tanks, infantry, howitzers and GEV's (Hovercraft), the other side has only one piece. That piece is the Ogre, a living cybernetic supertank armed with massive guns, anti-personnel mines and missiles. If you can't wait for the computer version you may still be able to track down the original board game. If you find it, buy it!

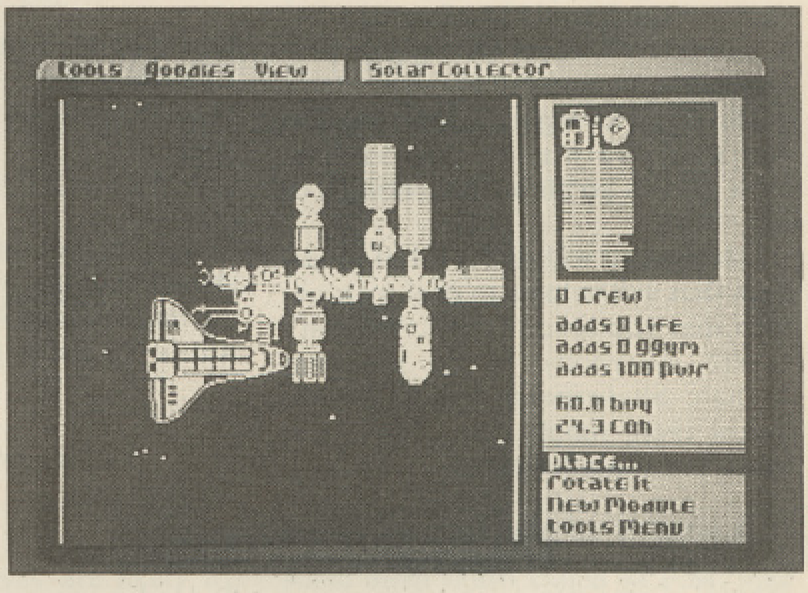
Autoduel (Origin Systems via Microprose) casts you into the strange role playing world of Car Wars. It's hard enough to survive in a world where you must build, armour and pile weapons onto custom cars that then either plug it out in arenas or battle on the open road. As you get the smell of petrol, smoke and blood in your nostrils you'll want to drive on until you're the best. Drive offensively, the life you save could be your own!



Electronic Arts, the latest US software house to setup shop in the UK, have just released EOS (Earth Orbit Stations). Seven missions drive 1-4 players deeper and deeper into space as they compete to build bigger, better and more profitable space stations.

Depending on the scenarios which range from building a dry dock in Earth Orbit to a race to search for life you will have set number of turns or quarters to build set space stations or race to have the highest technology level. Whatever the mission your first priority is make as much money as you can to be able to fund the target projects.

Every space station needs a command centre and logistics module and then as many power plants, life modules and galleys to provide the people, power and support for any of the money making or research getting installations such as spaceports, chemical labs, weather or



communications satellites, forestry labs or space tugs. As you make more and more money (hopefully) you can turn some of your modules from commerce to research and build up your tech. level which may earn you victory points and allow you access to the more complex and profitable modules.

A successful player will also have to play the markets and set as high a price as he thinks he can get for the goods created by his modules. Get this right and you can get ahead in the space race.

The game is played through a selection of menus between 2-4 players that can human or computer opponents. It's easy to learn but can be tricky to play particularly when you're trying to judge how many life, power and galley points you need to install a new module.

Touchline:
Title: *E.O.S.* ***Supplier:*** *Electronic Arts, Langley Business Centre, 11-49 Station Road, Langley, Nr. Slough, Berks SL3 7YN.* ***Tel:*** *(0753) 49442.* ***Machine:*** *C64.* ***Price:*** *£16.95 (disk).* ***Originality:*** *7/10.* ***Playability:*** *8/10.* ***Graphics:*** *6/10.* ***Value:*** *7/10.*

Finally, over a year since its announcement we are still waiting for Star Trek – the game. Beyond's stand at last year's PCW show was built to look like the bridge of the Enterprise. I have played the Atrai ST version (which is expected to beam down in the next few months) but all Beyond will say about the C64 version is 'it's being done'.

Contributions

So you own a Commodore? So you've written some programmes? So why haven't you sent them to us?

Your Commodore is always on the look out for new programmes, hints and tips, articles and even regular series. In fact if you have something that you think could be of use to other Commodore owners we want to hear about it.

So if you have got something which you think we may be interested in. How do you go about submitting it to us?

Below you will find a list of guidelines that will help us to deal with any item that you send in to us. We don't expect everybody to be the next William Shakespeare but if you do follow these simple rules then it will make our job a lot easier.

1) If possible all material sent to the magazine should be typed or printed out on a computer printer.

2) All text should be double spaced i.e. there should be a blank line between each line of text. You should also leave a margin of about 10 characters around the text.

3) On the very first page you should put the following:
   Name of the article
   Machine that it is for
   Any extras required – disk, printer etc.
   Your name
   Your address
   Your telephone number

4) The top of every page should have the following information on it:
   Abbreviation of the article title
   Your name
   The page number

For example, suppose you had submitted an article on C64 interrupts. You should put something like the following at the head of the page:

Interrupts/J.Smith/1

5) Please make sure that you do not make any additional marks on your text especially underlining.

6) Try and write in clear concise English, it does not have to be a work of literature but it must be comprehensible.

7) On the bottom of each page you should put the word MORE if there are more pages to the article or ENDS if it is the last page.

8) If possible, enclose a listing of all programmes.

9) Under no circumstances use a staple to hold the pages together. Use a paperclip instead.

10) Programmes should be included on either disk or tape. Make sure that you SAVE two copies of every program so that we have a better chance of loading them if problems occur.

11) Programmes under 10 lines can be included in the text. If your program is longer than this you must enclose a disk or cassette.

12) If your article needs any artwork then supply clear examples of what is needed. We don't expect you to be an artist but we do need to see what is required.

13) Photographs, if necessary, must be either black and white prints or colour slides. We can take shots ourselves so don't worry about this too much.

14) Submissions of any length are welcome. If you have a five line routine that you think may be of use to someone else we welcome it just as much as a full blown six part series.

15) Payment varies quite a lot and depends on quite a number of factors, such as complexity of program, presentation of program, number of magazine pages it takes up etc. Payment is generally between £10.00 and £800.00.

16) All payments are made in the month that the magazine containing your article has appeared in print.

17) If we do find your submission suitable for inclusion in the magazine we will write to you giving the terms of publication, the rate of payment and an agreement form. Prompt return of this form will allow us to use your program as soon as possible.

18) If you want the program returning to you, should we find it unsuitable for publication, then you should enclose a stamped self addressed envelope.

19) If you use a wordprocessor then enclose a copy of your text on the disk and state clearly which wordprocessor you use.

20) Send your programmes/articles to:
Your Commodore
Submissions
1 Golden Square
London
W1R 3AB

21) Your Commodore cannot accept any responsibility for items sent to the magazine.

The ICPUG Column

With the growing popularity of the Amiga, many ICPUG members are using their utilities for both the Amiga and the Commodore, which can lead to problems.

By Tim Arnot

Well, now that we've got the introductions out of the way, and the commode...oops, Commodore show report, we can get down to what this column is really all about. Namely whizz-bang-techie-guru-magic (what?).

ICPUG's membership covers the whole spectrum of Commodore computers from the early KIM-1 through VICs, 64s, 128s and Amigas. In our bi-monthly newsletter-come-journal, we try to reflect this wide range of interests. However, we can only print what our contributors write, and so this policy does not always work.

At a recent committee meeting, it was stated that 95% of enquiries we are receiving are from people who already have or are seriously considering buying an Amiga 500. This leads me to think that in maybe a year or two, the 64 and 128 will be reduced to the historical status of the PET and VIC. Indeed, the muted presence of 8-bit products at the recent PET show (or is it Amiga show?) would tend to confirm this.

Before that happens, there will be a transition period, where people are using both technologies. As they move from 8 to 16 bits, they are likely to want to take their wordprocessor, spreadsheet and database files with them. This is the problem which I will expand upon this month.

Compatibility Problems

The first problem comes when you take your data disk out of the 1541 and insert it into the Amiga's internal disk slot – it won't fit. Commodore's engineers, normally very clever people, seem to have made the hole too small. Being resourceful people, they made the diskettes fit by reducing their size. Unfortunately the media now falls out, and the protective cover just disintegrates!

Thus, they produced a stronger, plastic jacket for this smaller disk, and for good measure, threw in a metal shutter to protect the surface from baby and the cat. The polarised casing also stops people from flipping the disk, a deplorable practice anyway, as it sure gets my 1571 confused! Then, to add insult to injury, they did away with that nice G.C.R. recording system that we're all used to, and started to use some alien mush called M.F.M. Just because every other jack computer uses it, it is no reason for Commodore to start.

OK, so we've got to get our stored information from the 1541 onto a disk which is the wrong size, records in a foreign language and has a strange directory structure. We might also have to convert from PETSKII or screen codes to ASCII, but given a small amount of programming expertise, that's not a real problem. Presuming we know that the 64 will read the 5.25" disk and the Amiga will write the 3.5" disk, all we have to do is make the 64 tell the Amiga what's on the disk. You could also go the other way if you wish.

For instance if you use an Amiga word processor and want to upload text onto a bulletin board using the Compunet modem, the way to do this is best summed up in one word. Async. (pardon?) Yes, Async.

Async stands for ASYNChronous communications, and is normally associated with sending and receiving data through the serial port. By this, I mean the RS232 port, not the Commodore serial bus, which is a

bastardised form of the IEEE-488 parallel standard.

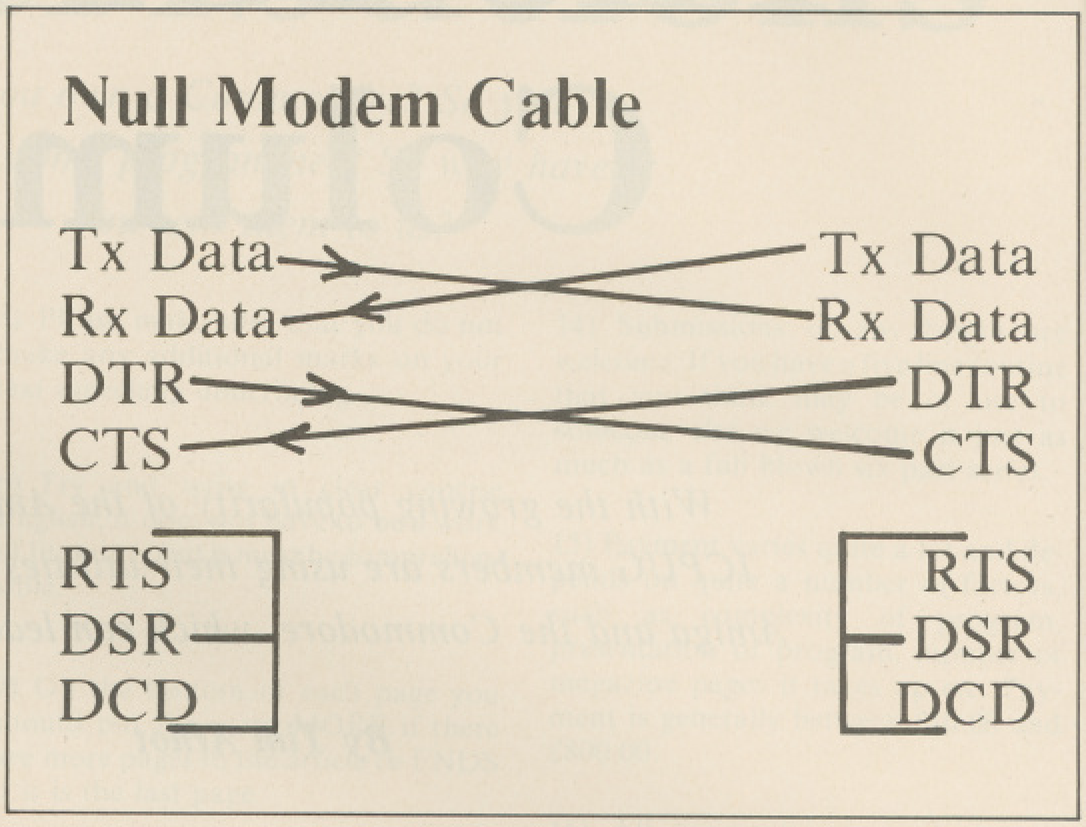
Guess what? Commodore failed to implement RS-232C properly on the 64 and 128. Plus/4 owners are lucky in that respect as they have true RS-232 right up to 19K baud. So some sort of interface is needed. Examples of these can be found by looking through adverts in this and other magazines. I personally recommend the interface made by Brain Boxes (£49.95, 051-200-2500).

You will need to connect the RS-232 ports in a configuration known as a 'null modem' (fig. 1). Basically this makes each computer think it is driving a modem and not another computer. Refer to the computer's technical manuals for the pinouts of the serial ports.

Rather than writing your own software for transferring the files from one machine to the other, there is a public domain file transfer program available which makes it relatively easy.

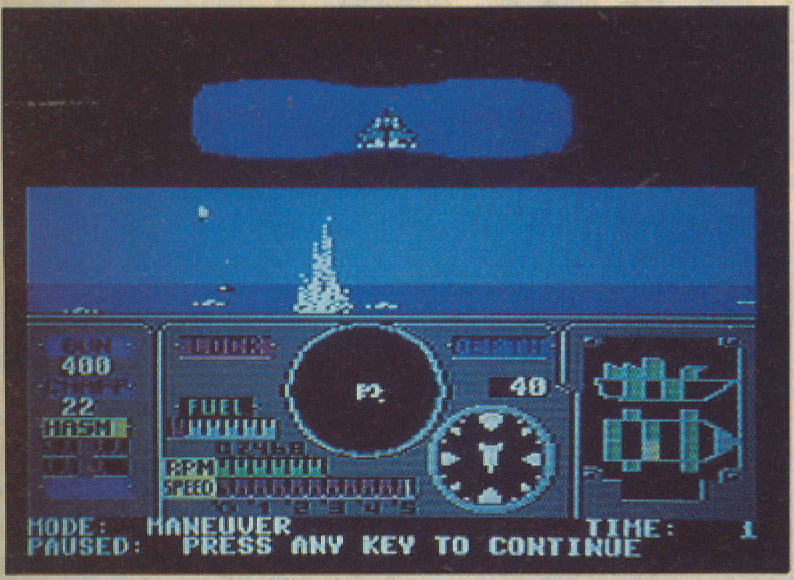
This is called 'Kermit', and is available for virtually every personal computer under the sun. We certainly have it in all the ICPUG libraries. Before you ask, yes it was named after a small and lovable green frog!

So, connect the cables, boot up the software, transfer the files and life will be easy. Or will it? YC



Games Reviews

Need some advice on the new releases? Then cast your eye over the latest batch of games.



Pegasus

You've flown a plane, taken a helicopter gunship for a spin, dived to the depths in a submarine and gone on patrol in a destroyer. Now here's your chance to fly across the waves in a hydrofoil.

This isn't going to be a joyride as you're at the controls of the PHM Pegasus. It's one of the heavily armed patrol boats like those on service with the NATO allies USA, Italy, and Israel and it's your job to complete one of the eight assigned missions. These range from target practice (although even these shoot back) to the highly topical but almost impossible job of escorting a supply ship from Kuwait, through the Persian gulf to the safety of the open sea! The only trouble is that the Gulf has become a war zone and ships are being attacked indescriminately.

To carry out your mission you'll have to master the controls and weaponry of the Pegasus so you can react to any threat quickly and decisively. And at the same time, control the overall strategy of the mission as well as two search helicopters and the supply ships from a separate map screen.

The map screen is used to plot your course and speed as well as those for the helicopters and supply ship. Then you sit back and wait for the action. You don't have to wait long (you can speed up the game clock by 128 times normal speed) as enemy ships will soon be picked out by hydrofoil and helicopter radar screen. As soon as you see a blip you leap to manual controls and the instrument screen that shows fuel, speed, compass, radar and weapons gauges as well as a 3D view ahead and above that an enlarged binocular view of any locked on target. When the target is in range you can either take it out from a distance with a guided missile or try out you shoot skills with the 76mm water cooled naval gun. Either way you haven't got much time as other ships will soon be in the area.

Pegasus lacks some of the detail of other simulations such as Gunship and Silent Service, however it does compensate for that in action. Another recruit for your collection of combat simulations.

T.H.

Touchline: *Pegasus.* ***Supplier:*** *Electronic Arts, Langley Business Centre, 11-49 Station Road, Nr. Slough, Berks SL3 7YN.* ***Tel:*** *(0753) 49442.* ***Machine:*** *C64.*
Originality: *7/10.* ***Playability:*** *8/10.* ***Graphics:*** *8/10.* ***Value:*** *7/10.*

Black Magic

In a time of hapless warlocks and evil wizards, many moons before the civilised man came to be, class was a word not known and honour was judged by magical status. As you can imagine, it wasn't very nice being a normal person, being turned into a one eye'd dancing polar-bear, for the wizards amusement, and then left to dance around the village, only to be caught by the local fur coat maker – not very funny.

Anyway on with the real plot. You are, as it were, a normal person – a resident in the once peaceful village of Marigold.



The once lush green fields are now misty cemetries where the bodies of Zargrim's (I'll come to him in a minute) victims are dumped. The towns are deserted and only the demons occupy the once happy homesteads.

This makes you very sad and angry (boo hoo) The last straw comes when Zargrim, the evil warlock of great power, kills your magic tutor, who taught you all that he knew. (Which wasn't very much as Zargrim had nicked all the magic books). So filled with anger you set off to kill the mighty Zargrim, but as you pack your rucksack you discover an old dusty parchement that tells the story of a wise old man called Anaker who was defeated by Zargrim and then had his six eyes nicked (yes, six) and placed randomly around the land so he could watch in vain as the land decayed and crumbled.

You decide to find Anaker's six eyes and place them back in the sockets (cringe). Anaker, by the way, has been turned into a statue, hidden away in the wilderness by Zargrim.

Well, what's the game like? Very good indeed, I haven't stopped playing it yet. Okay, the graphics are a little dodgy and sometimes dull, but the game is brill, with nice spot effects and a hige playing area. this type of game is new to me as I'm more of an arcade freak myself, but I just hope that US Gold make a follow-up to it, and then a follow up to that. Well, stop biting your toe nails and get this game, you won't be sorry.

K.R.

***Touchline:** Black Magic. **Supplier:** US Gold, Units 2-3 Holferd Way, Holford, Birmingham B6 7AX. **Tel:** 021-536 3388. **Machine:** C64. **Price:** £9.99 (Ca)/£14.99 (Disk).*
***Originality:** 7/10. **Playability:** 9/10. **Graphics:** 5/10. **Value:** 8/10.*

Centurions

Most of you kids out there must have seen that new American cartoon, The Centurions; those space-age super heros who live high above the earth observing live on earth. And whenever something bad happens they beam down to our humble planet and zap the bad guys.

Well, it had to happen sooner or later didn't it – the cartoon of the toys of the game and so on. The idea behind the game is this, the evil Doc Terror plans to get his slimy hands on a deadly nerve gas, which is hidden in the centre of a high security complex. throughout the complex there are masses of doors which are all locked, and all need a special key to open it.

You and your centurion pals have to get into the complex's heart, locate the nerve gas and keep it safe from the Doc, sounds easy, doesn't it? Well I've seen the map for the level and it's huge, and one thing's for sure – it'll keep you busy for a long time.

At the start of the game you can choose one of the following characters – Jake, Ace and Max. Each have different skills, such as skills in the air, land and sea. You start off as a droid and must choose which skill you want.

Through-out the game there are patches of sea, air and land, in the middle of which are keys. So, if you are in sea mode and need a key that is surrounded by air (!) then you will have to go all the way back to the start and change your mode! The doors show which key is needed to open them by the keyhole, i.e. a door with a round hole will need a round key to open it.



This game is a little bit like Gauntlet where you can have two players involved at the same time. You can also collect various weapons as when you have shot a certain amount of nasties power-exoframes start to appear. On collecting these you are given a fruit-machine type chance to pick a weapon, press your button and a letter will be selected, with each letter being a different weapon and if you are lucky enough to get 'A' you will get extra strength and a random weapon.

Although there are only three ways to this game, they are so comprehensive that they are more than enough.

I wouldn't say this was a game for shoot-em-up freaks, as it involves a lot of thinking and memory, with a fair bit of blasting as well. Yet another playable and polished game from the main man Mr Crowther. Well, don't just sit there picking your nose, go and buy this game, it'll keep you busy for weeks on end.

K.R.

Touchline:
***Title:** Centurions. **Supplier:** Ariolasoft, 68 Long Acre, Covent Garden London, WC2E 9JH. **Tel:** 01-836 3411. **Machine:** C64. **Price:** £9.99.*
***Originality:** 5/10. **Playability:** 8/10. **Graphics:** 8/10. **Value:** 9/10.*



Living Daylights

After the release of View to a Kill, I approached their latest title with an open mind. No doubt you have seen or at least heard of the new Bond film, the Living Daylights, if you haven't, sit tight.

You play the part of James Bond on a mission to rescue the lovely Kara and help a fellow agent General Koskov. But as you know, this will be no easy task.

You start the game in Gibraltar, training with the SAS. They conceal themselves behind rocks and jump out randomly and shoot you – don't worry though, it's only paint pellets. But somewhere on this level hides an enemy agent out to kill you, kill him and you will be taken to the next level.

Before entering the second level you are asked to choose a weapon from a list of four. Make sure you choose the right weapon though. Here it's just more of the same shoot-the-baddies, but not Joe Public – if you do shoot a passer by you'll lose points and a 'wheeeeee' sound is played. This would have been better if when you shot an innocent person a blood curdling scream was heard (Friday the 13th style) and it would certainly put you off shooting any more Joes.

You play the game over eight levels, with increasing difficulty, but as I said before this game is almost the same all the way through. Just shooting jumping and dodging, but don't get me wrong, it's not a bad game at all, if it was 'a bit more varied, it might have got very high marks. But as it stands, it is a playable game that is let down by repetitive levels. It's a shame though, there were so many things that could have been put in, for instance a lively car chase with multiple weapons.

Oh well, there you have it, a great license that could have been brill, but unfortunately is only average.

K.R.

Touchline:
***Title:** Living Daylights. **Supplier:** Domark, Domark House, 22 Hartfield Road, Wimbledon, London, SW19 3TA. **Tel:** 01-947 5622. **Machine:** C64. **Price:** £9.95 (Ca)/£12.95 (Disk).*
***Originality:** 5/5. **Playability:** 7/10. **Graphics:** 7/10. **Value:** 5/10.*

Epyx Epics

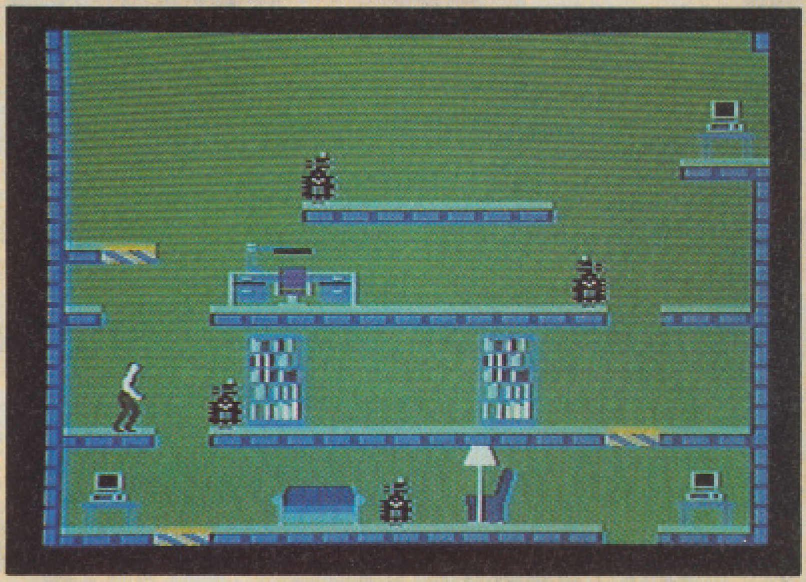
Whenever a magazine does a retrospective of great Commodore blasts from the past you can guarantee that Impossible Mission will be mentioned somewhere. Now you can add it to your collection and have Summer Games, Pitstop II and Breakdance added to the bargain. Yes, it's big value time from US Gold with their latest compilation Epyx Epics.

Few American companies can boast the string of successes enjoyed by this Californian team and, with the exception of Breakdance, this is a collection of their golden C64 moments.

I admit that Pitstop is perhaps showing its age, if only from the technical point that Grand Prix races no longer permit refuelling stops. As a racing simulation it still has the novel approach of fuel and tyre watching to recommend it over other Pole Position spin offs. In addition there are six real international circuits to choose from, either three, six or nine lap durations and three skill levels.

Playing at Pro level against the computer is almost impossible but you can always drag in a friend to play against you. Could Pitstop II's re-release have something to do with bigger plans from US Gold? Watch this space. . .even better read the news pages.

In case you've forgotten, Summer Games is the one with



pole vaulting, diving, the crippling 4 x 400 metre relay, the 100 metre dash, gymnastics, freestyle swimming (100 metres and relay) and skeet shooting. Eight events in all to test your endurance, skill and speed. This is the one that started the Epyx sports craze which has now taken in Summer Games II, Winter Games, World Games and the new California Games. I hope we'll see the rest of them on compilations soon.

For me, Impossible Mission is the text book game. It has everything from simple but tricky gameplay through to the deeper level of puzzle solving. Add to this unsurpassed voice synthesis with magically animated graphics and I think you'll agree this is the ultimate. With rumours that Impossible Mission II will be appearing soon I may have to revise my opinions, but until then this is the showpiece.

Evil Elvin Atombender has a plan to destroy the world and several agents have been lost trying to foil his plot. Elvin

has locked himself away inside his underground stronghold and the coded keys to his hideout are scattered in pieces inside the furniture. Guardian robots will make sure that you won't get the codes easily as you race against time to defeat the mad professor.

When I first heard that Breakdance was being written I thought it would be awful but I was wrong – it's dull. A lot of effort went into trying to create an interesting game but it's basically a dance version of the Simple Simon music game.

There are four elements to the full game. In the first you match the moves of Hot Feet, the local hero. Then you try to outdance the Rocket Crew who try to dance you into the river. The third challenge is against the Breakdancing king and in the final phase you can build up your own dance.

At £9.99 for the collection, the relative cost per game is about £2.50. At this price it should be in everybody's library or you really are missing out.

E.D.

Touchline:
Name: *Epyx Epics.* ***Suppliers:*** *Epyx/US Gold, Unit 2/3 Holferd Way, Holferd, Birmingham B6 7AX.* ***Tel:*** *021-356 3388.* ***Machine:*** *C64.* ***Price:*** *£9.99.*
Originality: *8/10.* ***Playability:*** *9/10.* ***Graphics:*** *9/10.* ***Value:*** *10/10.*



Defender of the Crown

There I was, sorting the mail, press releases and final demands on payment for our editors hairdryer (on HP), when out of an envelope came Defender Of The Crown. 'Yeah, great' I shouted with glee and carefully stuffed it in the disk drive. After a few whirrs and clicks a nice title screen appeared with glistening metal and smart music. I knew then, I was in for a treat.

I'm sure most of you have heard of this game which grabbed the headlines of most magazines for its wonderful graphics and music.

The game is set in the 12th century in days of old when knights were bold and all that stuff. You can choose from a list of characters who are different skills i.e. some are good leaders but poor at sword fighting or could be good at jousting but a grotty leader – it varies.

After the title screen and 'credits' have gone you will be asked to choose the character you want by pushing left and right on the joystick and a picture of the character and their abilities will be shown.

This done, it's on to the game. You are represented by a black shield on the map, which incidently is where a lot of the came play takes place. You can transfer men from your home garrison to an army which you can place on a plot of land. When your move is over the computer then takes control of the other five players and so on.

Moves available to you are either to go raiding, where you can visit a local or not so local castle and attempt to steal their gold, but being of Saxon blood it's best to pick a Norman castle. First you have to fight your way past two guards, and if you have picked a poor swordsman you stand a good chance of losing.

I must mention the shadows that appear on the walls as you fight the guard inside the castle, as they are especially well done. You can also call tournaments provided you have the cash. After you call a tournament you are asked if you would like to joust for fame or for land. If you lose the battle and you choose fame your leadership rating will be reduced, or a piece of land lost depending on what you gambled for. If you do manage to win the joust you are greeted by cheers from the crowds and on your third win a nice little piccy comes up on screen showing you on your horse being presented with a prize from the King.

My favourite part of the game is the love scene. You are alerted by the wailing of a Saxon maid, and two options are available to you – either rescue or ignore her. If you manage to rescue her you will be greeted by an innocent-looking maid, who flutters her eye-lids at you. As you close in, she takes her clothes off (you'll go blind: ED) and last but not least you take her in your arms and give her a big smacker on the lips.

After that excitement you are then rewarded with her hand in marriage and the joining of the two kingdoms. However, if you ignore her, you are a coward.

My other favourite scene is the siege. Here (provided you have a catapult) you must attempt to knock down the enemies castle wall with boulders, but this is quite tricky as you have limited boulders and each shot fired is a day gone by. Disease and burning pots of molten goo are also on hand for reducing the enemies army, but to get them over the wall you have to shorten the wall. You will then go into battle and the player with the most men gets the castle.

All battle scenes and their outcomings depend on how many men you have and what strategies you use. You could try and outflank your opponent with your leadership or choose to just stand and fight among many other options.

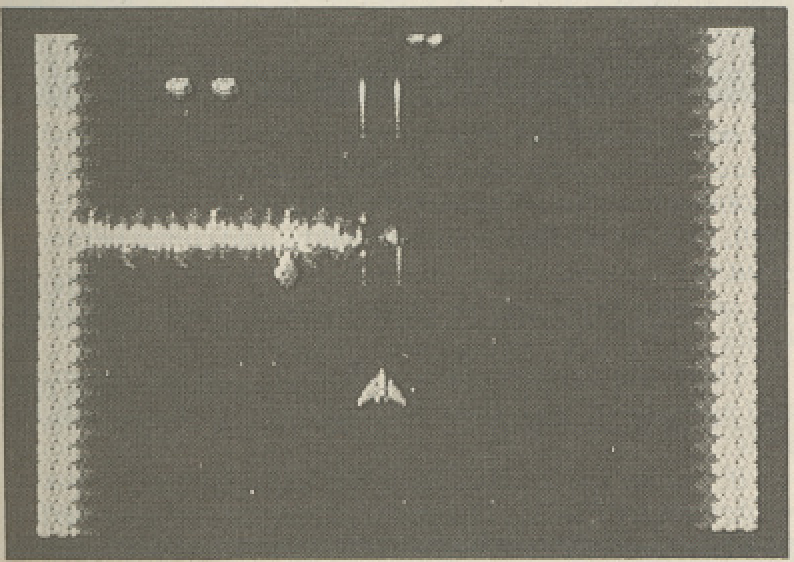
Playing Defender of the Crown was a joy, there are so many options open that each game you play is almost different. The love scene for example is random – you never know when it's going to appear, so if you were out of cash, and a fair maiden needs rescuing it could be a good chance to bump up your readies. The graphics are also quite brath-taking and really build an atmosphere, though a lot of them are not animated. The music, well this is very good, loads of different tunes for each part of the gamme and very medieval too.

My only moan about the game is the various bugs which occur now and again. For example you could place five men in an army, then suddenly have twenty, but the small bugs

don't really spoil the game. It just gives the slight feeling that you are not in control of the game. However this is no reason not to buy the game, and quite frankly you would be a fool if you didn't.

K.R.

Touchline:
Title: *Defender Of The Crown.* ***Supplier:*** *Mirrorsoft, Athene House, 66-73 Shoe Lane, London, EC4P 4AB.* ***Tel:*** *01-377 4645.* ***Machine:*** *C64.* ***Price:*** *£14.95 (disk only).*
Originality: *9/10.* ***Playability:*** *9/10.* ***Graphics:*** *10/10.* ***Value:*** *9/10.*



Lazerforce

One thing you are guaranteed from a quality budget range is a good choice of shoot-em-ups. Code Masters latest game is a blockbusting blast consisting of several mini game parodies of old rave ups combined in a new and fresh way.

The rules are simple – survive! As the pilot of a delta winged starfighter you have to negotiate 32 levels of Hell, with each level consisting of four torture chambers.

The first challenge is reminiscent of a stage of Salamander, the arcade classic. Tongues of flame reach out to lick round your flavour-of-the-month craft. As the screen scrolls relentlessly down it reveals an amazing assortment of gun fodder attacking in miriad ways. From behind come the backward firing attackers; mean machines who care little for obstructions in their path. It's all happening at once; it's hot, sticky, frantic action. Make contact with a WOP (who he?), your double fire power is increased to triple power and you can really give the enemy a roasting.

Another weapon in your armoury is the Energy Divergence Bomb which destabilises the kinetic energy of the alien craft and vapourises them all. Your store of EDBs is limited so use them wisely.

Assuming you survive, you meet the Guardian Zone, which is a Centipede style game, only four times more fiendish. Still the attack waves descent towards your small sweatpit of a ship but now centipedes appear spiralling down towards you through the mushroom shaped space debris. Here again you can enlist the use of WOPS and EDBs.

Now the calm comes after this storm as you dock with your mothership to refuel and gain bonus points for success. These points can be increased as you pass through the convoluted tunnel. If you crash in either of these phases you will not lose a life, so be as daring as you like.

Here endeth the first level and although the rest of the game follows the same pattern the style changes. Level Two starts with mechanical arms reaching out and blocking your path, making you swerve like crazy to avoid collision. Level Three has bubbles which don't move but have to be dodged around as you zip along on your way.

Lazerforce is the best game of its type that I have seen in a long time. If Jeff Minter wants to relinquish his crown as King Zap, Gavin Raeburn is a worthy successor. So much for so little, what a bargain!

E.D.

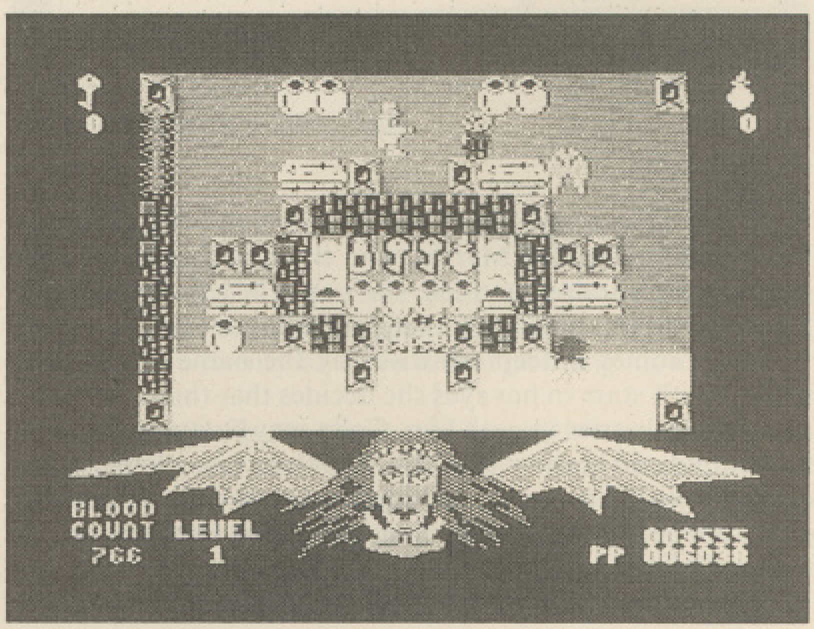
Touchline:
Name: *Lazerforce.* ***Suppliers:*** *Code Masters, 1 Beaumont Business Centre, Beaumont Close, Banbury, Oxon, OX16 7RT.* ***Machine:*** *C64.* ***Price:*** *£1.99.*
Originality: *7/10.* ***Playability:*** *10/10.* ***Graphics:*** *8/10.* ***Value:*** *9/10.*

The Astonishing Adventures of Mr Weems and The She Vampires

At first glance there is more than a passing resemblance between this game and Electric Dreams' Dandy. Not surprising really because they're both sourced by the popular but ever so slightly whacky Ram Jam Corporation. This bunch have been on the games scene since the year dot; for the most part hiding behind larger companies such as Electric Dreams and Mosaic, but this time working for Piranha.

Mr Weems is set in the distant past when there were two kinds of living dead – Vampires and Chartered Accountants. The only similarity between these breeds is their blood-sucking ways. Nowadays there are only CA's and this game provides a possible answer to the question of how the Vampires went into a decline.

Weems is not a run-of-the-mill accountant, he is a failed run-of-the-mill accountant. After flirting with a heady



alternative career as a lion tamer, circus life lost its bite and so he turned to vampire hunting. Armed with a rapid-fire garlic gun and a single smart garlic pill we join our dull little friend in his greatest moment.

Deep in a Transylvanian chateau the She Vampires and their cohorts are out for blood as they stalk Mr Weems. Nonchalantly, Weems blasts bats, Frankenstein monsters and minor She Vampires with the same kind of detached indifference which he adopts when he tots up rows of figures in Company ledgers. This time it's his blood count which interests him, if it falls to zero so does he!

Hidden around the enormous house are keys to rooms and secret passages. Vials of precious blood will replenish his failing health and garlic bombs help to clear screen-upon-screen of fiends.

Weems can blast away the corpuscle consumers permanently if he clears away all of the nasties in a particular area. This renders the evil-generating tombs vulnerable to his attacks. Each tomb-free room becomes permanently exorcised, but just one unscathed generator will breed more creatures of the night when Weems returns.

After eradicating fivel floors of demons, Weems faces the wrath of the Great She Vampire. If he has the tools he'll finish the job, if he is ill-equipped the She Vampire will prevail.

At first I thought this was just another Gauntlet clone but it has a uniqueness which won me over in the end. On the credit side, the game possesses that cut and come again appeal which the frantic original failed to deliver. In the debit column is the Spectrum style of graphics (but not as ghostily ghastly as Dandy).

I think the similarity between Dandy and Mr Weems may have an adverse effect on sales that even a silly title will fail to counteract. The cover illustration wins my vote as the worst I have seen in a long time. A shame really because Mr Weems shows a vast refinement of style over its predecessor and deserves to win a larger audience.

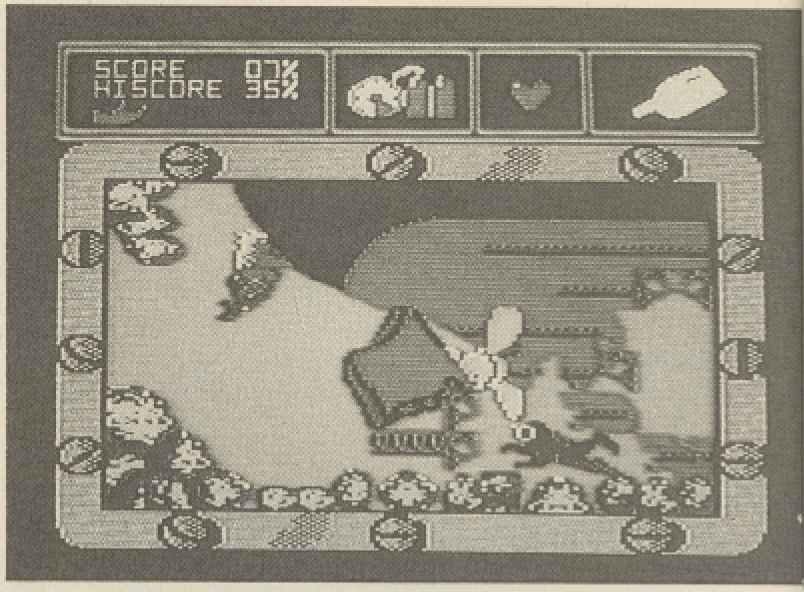
E.D.

Touchline:
Name: *The Astonishing Adventures of Mr Weems and the She Vampires.* ***Suppliers:*** *Piranha, 4 Little Essex Street, London WC2R 3LF.* ***Tel:*** *01-836 6633.* ***Machine:*** *C64.* ***Price:*** *£8.95.* ***Originality:*** *8/10.* ***Playability:*** *9/10.* ***Graphics:*** *7/10.* ***Value:*** *8/10.*

Mermaid Madness

Once upon a time there was a really ugly, old, cabbage-faced mermaid called Myrtle, who thought that at the ripe old age of a hundred and ten, she would be left on the shelf. So there she was sitting on the pier feeling sorry for herself, when up comes a deep sea diver by the name of Careless Colin. With stars in her eyes she decides that this is her man and promptly tries to grab him. Colin may be stupid, but not that stupid and he dives quickly off the pier to avoid her open arms. Foolishly hwoever, he hides under a wrecked boat and gets trapped. Myrtle the Mermaid is horrified and sets out to rescue Colin.

This is where you take over – you must guide Myrtle, who



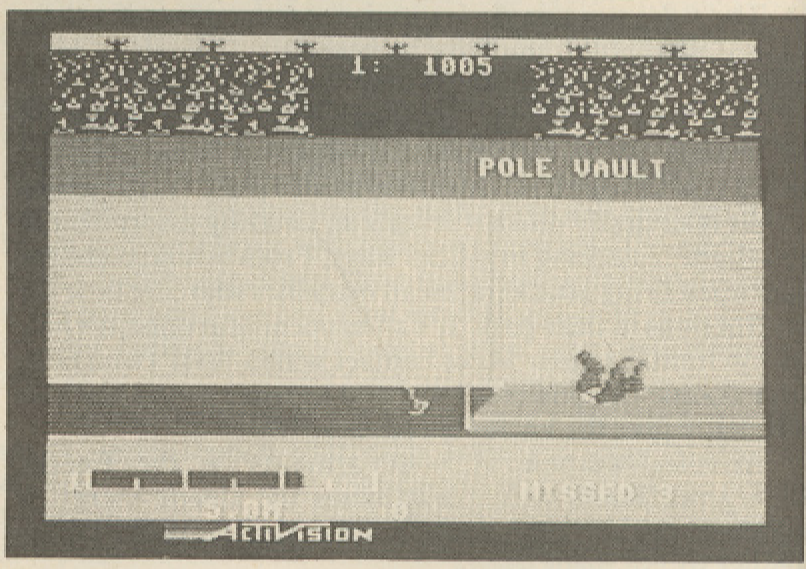
can walk on land as well as swim in the sea, who will need to collect various objects, in order to progress. For example, you must find the dynamite to blow up rocks that block your path, find the use for the strange ankhs, and collect bottles of stout to keep your energy levels up. Also you have to keep an eye on your heart, as this beats faster the closer you get to Colin.

There are various sea creatures through-out the game and any contact with these will reduce your energy little by little.

If you do not already have this game (it was released a while back by Electric Dreams) then go out and get it, as for £1.99 it's good value. I must mention the music which is also quite jolly.

K.R.

Touchline:
Title: *Mermaid Madness.* ***Supplier:*** *Firebird, 64-76 New Oxford Street, London WC1A 1PS.* ***Price:*** *£1.99.* ***Originality:*** *8/10.* ***Playability:*** *6/10.* ***Graphics:*** *7/10.* ***Value:*** *7/10.*



Decathlon

Joystick waggling can prove to be a very tiring affair. This is especially true when you have to keep it up for some four

minutes non-stop in order to compete in the 1500 metres, the last event in the Decathlon. Originally released by Activision, Firebird have given the game a new lease of life at a budget price.

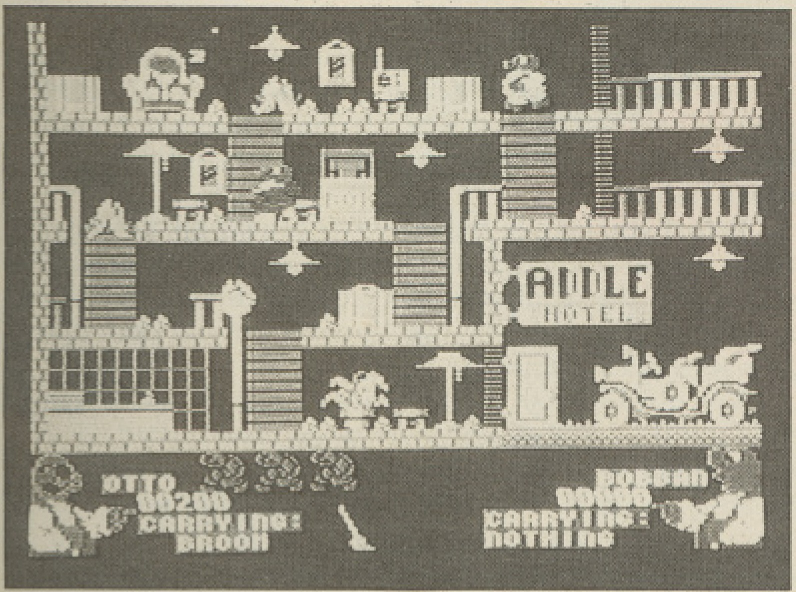
The events can be divided roughly into two sections – brute force and timing. There are three running events; 100, 400 and 1500 metres and you must keep the joystick moving from side to side just as fast as your hands will let you. In the other events, not only must you run up quickly, but you have to press the fire button to jump or throw.

Up to four players can take part simultaneously either in all ten events or just one. Points are awarded on the basis of your performance – the longer you throw the javelin, the better you score and as in real life, you soon discover that different people have different strengths and weaknesses.

Graphically, the game looks crude but that is irrelevant. Decathlon plays superbly. It was one of the first multiple-event type of game to be released and still stands the test of time. Superb value at under two pounds.

G.R.H.

Touchline:
Title: *Decathlon.* ***Supplier:*** *Firebird Silver, First Floor, 64-76 New Oxford Street, London WC1A 1PS.* ***Tel:*** *01-379 6755.* ***Machine:*** *C64.* ***Price:*** *£1.99.*
Originality: ***5/10. Playability:*** ***9/10. Graphics:*** ***4/10. Value:*** *10/10.*



Clean Up Service

Mr McSween, owner of the Addle Hotel has a little problem which is so bad, he can't keep his staff for long. What he needs is a hard-working person who can restore normality and the Hotel's reputation. Instead he employs Otto and Bobban, a pair of shirkers desperate for work after their exploits in Clean Up Time.

The instructions to this offering are non-existent, a deplorable habit which is common in the budget world. It took some time before I could work out what the game was all about. It was only when I discovered that there is a box of goodies on the screen that I started to understand the nature of the game. By rummaging in the box you find a gun, a brush and a bin lid which help to eradicate the litter louts who run from floor to floor.

In the impossibly difficult one player game Bobban sleeps upstairs as Otto dashes about in a futile attempt to rid the hotel of louts. The two player version brings Bobban into battle and the possibility of success becomes more feasible.

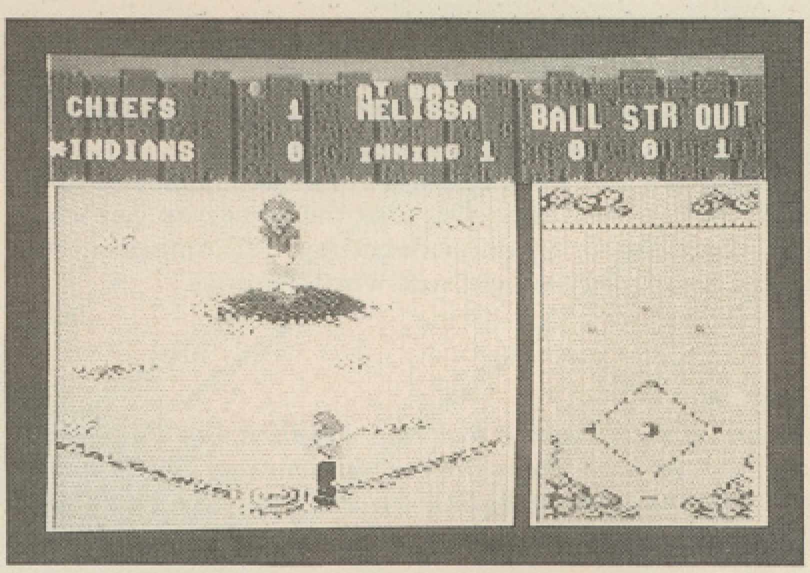
The louts emerge from several bins in the hotel, and the first task is to select which bin it is best to close to keep the louts at bay. Once a lid has been placed on the bin the real clean up begins.

Armed with the gun and a brush the team can limit the amount of litter the louts spread until all the rubbish is removed. On subsequent levels the creatures and the aims change – in the kitchen make a hamburger, go fire fighting, and beat the witch. In all, there are eight levels, more than enough for an excellent value budget game.

This is a graphically interesting game and, in two player mode, the game is tricky, challenging and enjoyable. As a one player game it's a non.starter. If your social group includes another computer freak with his own joystick you could do a lot worse than to buy this co-operation game. If you are a secret Commodore basher avoid Clean Up SErvice at all costs.

E.D.

Touchline;
Name: *Clean Up Service.* ***Supplier:*** *Players.* ***Tel:*** *(07356) 71500.* ***Machine:*** *C64.* ***Price:*** *£1.99.*
Originality: ***8/10. Playability:*** ***7/10. Graphics:*** ***7/10. Value:*** *9/10.*



Street Games – Baseball

If you're anything like me your experience of baseball games would be one of battling against the odds, and considering a twenty to seven defeat as being a pretty good achievement.

Epyx Street Sports version of baseball from US Gold is the exception to the rule, allowing plenty of interaction before and during the game. There is plenty of opportunity to improve your team's performance and the excellent graphics and gameplay make it the best simulation that I've seen so far.

There are sixteen kids on 52nd Street and all of them want to play. As captain you have to use your skill to select the best possible team. Each captain takes a turn and then you have the option of selecting your own batting order and field positions before the game begins.

None of the kids are great all-rounders and this makes the team selection a fascinating part of the game. Julie, for example, throws better than most of the boys on the team, but is lousy when it comes to batting. David, on the other hand, bats like a demon but makes a second-rate fielder. The skill of choosing is to select a team which covers its own failings as far as possible.

When the actual game begins you have a large degree to control over the action. You even choose whether you play on tarmac or grass. When batting, your only worries are when to hit the ball and when to leave it alone. Timing of your stroke is important and not too difficult to master because you are given perspective and overhead views.

These two views are especially useful when it's your turn to pitch. The ball can be swerved using the joystick in the most unnatural ways. A double swerve, or 'S' shaped pitch, is possible and useful for confusing the opposition. The speed of the ball can vary too. It might start as a slow pitch, but suddenly you can make it pick up speed as it nears the batting plate.

The main screen goes wherever the action lies. If the ball is flying towards the outfield you are shown the landing zone and it's up to you to move your nearest fielder into the zone ready for the pickup. Being backstreet baseball there's plenty of rubbish for the fielders to trip over. Some of the players are not so good at straight catches let alone tackling an obstacle course!

The graphics are brilliant. Special attention has been paid to colourful and realistic animation but the sound is sparse though quite inventive. You even get the occasional car horn blaring away in the background.

During a game you really get to know the players quite well, and the next time you load the game you can select different teams or try different batting or fielding positions. this is a superb game and well worth its price.

E.D.

Touchline:
Name: *Street Games – Baseball.* ***Supplier:*** *Epyx/US Gold, Unit 2-3 Holferd Way, Holferd, Birmingham B6 7AX.* ***Tel:*** *021-356 3388.* ***Machine:*** *C64.* ***Price:*** *£9.99 cass/£14.99 disk.*
Originality: *8/10.* ***Playability:*** *9/10.* ***Graphics:*** *9/10.* ***Value:*** *9/10.*

Jackle & Wide

Dr. Jackle has at long last perfected his transformation potion. Eager to see if it works, he takes a quick gulp and finds that he has a success on his hands. Well, not quite, as there are two slight problems. Although he has been transformed, the person that he has become, Mr. Wide, is not exactly the sort of person that you would like your granny to meet. In fact, he is thoroughly evil. The second problem? In your haste to try out your new option, you accidentally forgot to prepare an antidote.

There is only one course of action left to you. You must seek out the laboratory of your arch rival Dr. Piqued, hidden somewhere beneath Hyde Park. As he was working on the same problem, he might be able to provide the antidote.

The game is a problem solving arcade adventure in the format of wandering round, and picking up various items and using them to help you get past various obstacles. As such, it is no better or no worse than the hundreds of other games of this type but is not bad value at under two pounds.

G.R.H.

Touchline:
Title: *Jackle & Wide.* ***Supplier:*** *Bulldog, 8-10 Paul Street, London EC2A 4JH.* ***Tel:*** *01-377 6880.* ***Machine:*** *C64.* ***Price:*** *£1.99.*
Originality: *6/10.* ***Playability:*** *5/10.* ***Graphics:*** *4/10.* ***Value:*** *6/10.*

ACE 2

Ace is not only the sequel to the popular ACE combat flight simulator but also includes a second player and a second plane into the action.

The action takes place just off the coast of a foreign power where one player is based on an aircraft carrier sent to monitor a radar base. The land-based player takes exception to this and although the ship is in international waters a plane is sent out to intercept. Flyer one launches its carrier based plane to intercept the other plane and destroy the radar station.

Before you take to the skies you can set up the game by tweaking parameters that decide the number of planes each player has, the number of hits required to blast each plabe and the skill of the computer opponent if you can't find a human that can stand the pace.

You can arm your aircraft with a selection of close range heat seeking missiles and longer range radar guided missiles to dogfight with your opponent and also air to ground missiles to take out the carrier of the radar base. Unfortunately you can't carry everything you need all at once so you have to decide which weapons you need first.

As with any dogfight game you are in control if you're on his tail. Get in range and you can cut him down with a succession of missiles and then finish him off with cannon fire. However, he is trying the same tactics so you should be ready to take evasive action if he fires at you. This action can either involve rapidly changing your speed, direction and height, or firing a flare or chaff to confuse the missile.

The action is fast and frantic as daring manoeuvres must be carried out at top speeds. ACE 2 is a worthy successor to ACE and is certainly set to become a high flier.

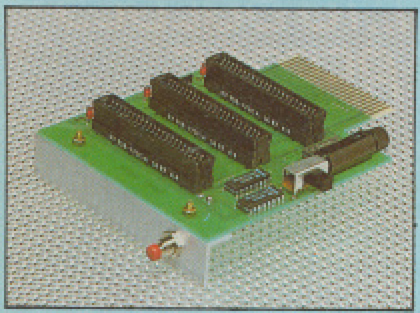
T.H.

Touchline:
Title: *ACE 2.* ***Supplier:*** *Cascade Games Ltd, 1-3 Haywra Crescent, Harrogate, North Yorkshire, HG1 5BG.* ***Tel:*** *(0423) 525325.* ***Machine:*** *C64.* ***Price:*** *£*
Originality: *5/10.* ***Playability:*** *8/10.* ***Graphics:*** *8/10.* ***Value:*** *8/10.*



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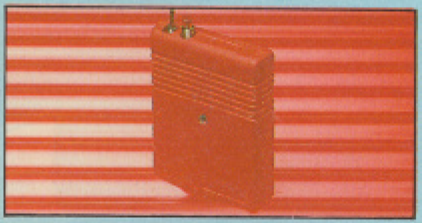
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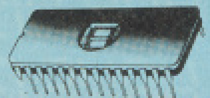
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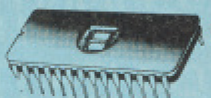
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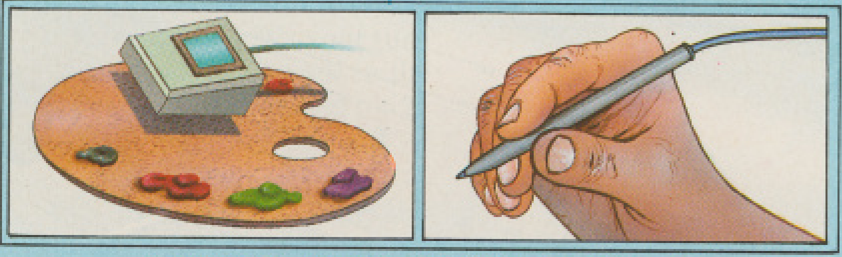


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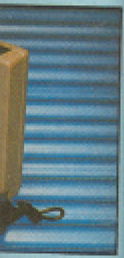
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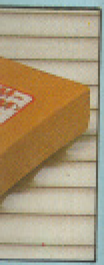
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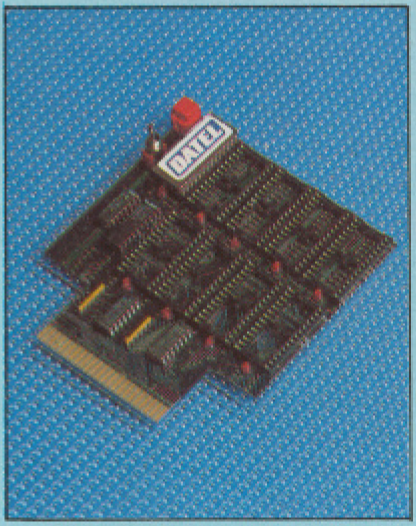
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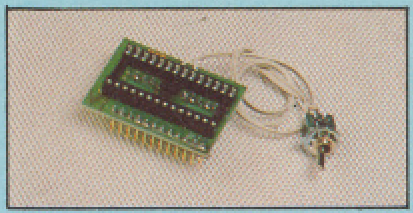
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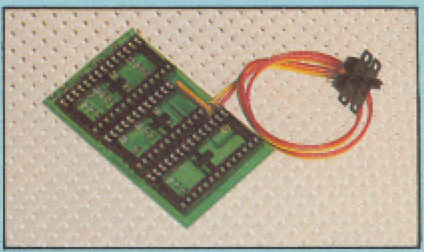




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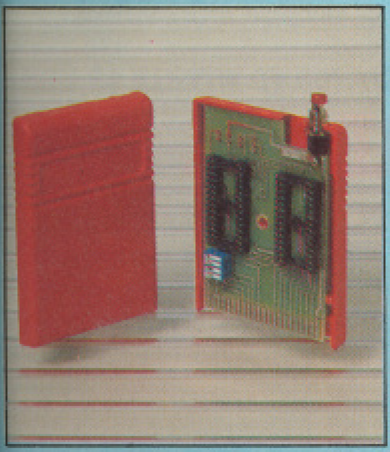
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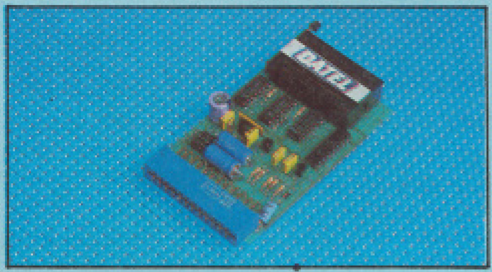
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Byting into the 6510

In the fourth part of our machine code programming series, we design a typewriter routine and learn more about flags and conditional branches.

By Burghard-Henry Lehmann

In the last three articles we have worked our way up to a point where we can now fill in the whole of the Commodore screen. In the following articles I want to develop a simple word processing program. I feel that this will cover a lot of ground in terms of machine code programming. Even if word processing is not your main interest, you will find that a lot of the principles we will deal with are just as relevant to you if you want to write an arcade game, an adventure game, a utility routine or whatever.

Of course, in the context of this series, it is not my intention to write a fully-fledged word processor you can use to hack out a novel. All I want to develop is a simple 40 column typewriter routine and some associated editing routines.

Key Input

So far we have dealt mainly with setting the computer to output data, namely to the screen. Now, where we want to develop a word processing routine, initially we need to get the computer to input data, namely from the keyboard.

Computer keyboards are very versatile – each key on the board represents nothing more than an electronic impulse, and what result this impulse has depends on a program, resident in ROM, which interprets it. So, each key on the board can do just about anything you want it to do. The A key on your C64, for example, can result in a capital letter A being printed onto the screen, as happens normally, or it can print a lower case a, if you switch the computer into the business mode; or you could re-design the A key into something completely different, like function key 1, or make it start your printer, hum a tune, or whatever you like.

All this is simply a matter of programming. As I have already mentioned, in the normal state of the C64 there is a program in the Kernal-ROM which interprets every impulse coming from the keyboard and converts it into an ASCII-code. This ASCII-code is stored in a series of locations, called the keyboard buffer.

Whenever the computer has nothing else to do, the keyboard buffer is emptied one by one and each ASCII-code is executed, that is, if it is a so-called printable character, the character is printed onto the screen, or, if it is a non-printable character, a certain action is taken, like moving the cursor, changing a colour, starting a new line, and so on.

All this is done by our good friend, the 6510 microprocessor. But since there is only one 6510 chip in each Commodore 64 computer, the question arises of 'how can all this be done without the system getting into an awful muddle about what to do first?' Furthermore, when you press a certain key you expect to get the result almost immediately! How can this be done if there is only one microprocessor which has to do this and a whole lot of other tasks besides?

Interrupts

The answer to this important question is 'interrupts.' This is a fascinating subject because it permits an 8-bit computer like the C64 which can basically only do one thing at a time, to pretend to do several things at the same time. It works because the 6510 microprocessor is able to do things at such tremendous speed. It's a bit like a magician who does tricks by sleight of hand – you can't see how he does it, mainly because he does it incredibly quickly.

The 6510 has all the speed of the best magicians, but, of course, it has none of the brains of a Houdini. Instead it does its tricks strictly to order.

Every 60th of a second it gets an interrupt command which it has to follow, except it it just has executed a machine code command which instructs it not to react to this interrupt. This is called a 'maskable interrupt,' because the microprocessor can be stopped from reacting to the interrupt. There is also a 'non-maskable interrupt' which cannot be aborted at all. We will return to all this later.

If the 6510 is not programmed otherwise it executes the maskable interrupt by interrupting whatever it is doing at this moment and saving the current address in the program counter on the machine stack so that it can continue from where it left off afterwards. Basically, it is very much like being called to execute a subroutine. The only difference with an interrupt is that the subroutine call does not come from inside the program with a 'JSR' instruction but is hardware-generated.

Hardware-generated means that a certain action the microprocessor has to perform is not instigated by a program but an electronic impulse coming from outside the microprocessor, as from a printer or disk drive or, as a matter of fact, another chip in the computer.

The interrupt routine which the 6510 executes every 60th of a second consists firstly of reading the keyboard. That is, the 6510 finds out if a key has been pressed. If a key has been pressed it goes through quite a complicated routine which interprets

Figure 1

BNE = Branch if result is Not Equal – if the zero-flag is NOT set
BEQ = Branch if result is EQual – if the zero-flag is clear
BCC = Branch if the Carry flag is Clear (A is smaller than B)
BCS = Branch if the Carry flag is set (A is larger or equal B)
INC = INCrement contents of memory location
DEC =DECrement contents of memory location
CMP=CoMPare with memory
CLC = CLear the Carry flag
ADC=ROd with Carry
SEC = SEt the Carry flag
SBC = SuBtract with Carry

that keypress.

I said before that each key generates an electronic impulse. This sounds very complicated, but isn't. All it means is that if any key has been pressed, a voltage is coming from the keyboard, while if no key has been pressed, there is no voltage. This means of course that the impulse generated is exactly the same for each key. How can it then distinguish between keys?

The keyboard is mapped into a coordination system and each key is interpreted by determining from which part of this co-ordination system the impulse comes. It's a long process of elimination, and the end result of this is an ASCII-code. This ASCII-code is then pushed into the keyboard buffer (location 631-640).

Amazingly enough, this is not all the 6510 does every 60th of a second, if the machine is in the normal mode it also puts the cursor on the screen into another 'blink-phase' so that it will appear to us slow humans as if the cursor is flashing.

Having done all this, the 6510 returns from the interrupt, recovers the address where it left off and continues with the task it was doing before as if nothing has happened. Quite amazing isn't it?

Returning now to our word processing task, there would be little sense in our writing a routine which reads the keyboard per se. All we need to do is to get hold of the last ASCII-code produced by the microprocessor and then write a routine which tells the 6510 what specifically we want it to do with that ASCII-code.

For that it would be best if we could have that ASCII-code in the A-register of the 6510. For this I use a very simple ROM-routine, called 'GETIN', which gets one character from the keyboard buffer and puts it into the accumulator. If there is no character in the keyboard buffer, that is, no key has been pressed, then a zero is loaded into the accumulator. This of course sets the zero-flag.

In line 340 of our program I introduce the opposite of the 'BNE' branch instruction which we have already learnt about. 'BEQ' stands for 'Branch if the result is EQual', that is, if the zero flag is set.

What we want to do here is obvious: if no key has been pressed, which results in the zero-flag being set, we loop back to the 'GETIN'-routine, until a key has been pressed.

Now the zero-flag will be clear because a number larger than zero will be in the accumulator. This is of course the ASCII-code we wanted. It tells us which key has been pressed. It is now up to us to do whatever we want with it.

Exit

'Exit already?' you may ask. 'We haven't even started yet.'

But this is very important in machine code programming. Remember, the 6510 has no safety-nets and doesn't give any error reports. If you set it on a certain course and don't tell it when to stop it will go on ad infinitum. There might be no way you can stop it, except by unplugging the machine. So always ask yourself the question: 'Has this routine I am writing got an exit?' This is more important in machine code programming than in almost any other language.

Most other bugs you can iron out in due time without much frustration. But if the 6510 gets itself into a routine or loop without an exit, you are well and truly lumbered. All you can do is unplug the machine and lose perhapshours of your work!

Surprisingly enough this but can even occur when your routine is basically working fine. For example, our typewriter routine would work perfectly without an exit. The problem would only arise when we want to get out of it. Because we can't except by unplugging the machine...

The exit I have chosen for our program is function key 1. If it has been pressed the ASCII-code 133 will be in the accumulator. So in line 380 I compare whatever is in the accumulator with 133 so that, if it matches, the zero-flag will be set and the 6510 will jump to the exit-routine in line 1110 via the branch instruction 'BEQ EXIT'.

In line 440 I do another test, this time against decimal 20. If you look onto page 135 of your user manual where all the ASCII-codes and how the C64 interprets them are listed, you'll find that decimal 20 is normally the value for the delete key.

Since I wanted to include a deletion routine in our program, line 450 is where the microprocessor will branch to if the appropriate key has been pressed.

Printing a Character

The routine in lines 470 to 740 outputs a printable character to the screen.

There are two sides to this routine – first we have to convert the ASCII-code into a screen code which the 6510 can put on to the screen in the usual way and secondly we have to determine the position on the screen where we want the character to be printed.

If you compare the ASCII-codes on page 135-137 in your user manual with the screen codes on page 132-134 you'll find the following main differences in the way the various characters are expressed.

Codes 32 to 63 match exactly. ASCII-32 is always a space and that is the first of the printable characters in the ASCII-range. After that follow various symbols, like "%" and "$" then the numbers from 0 to 9, then some more symbols and punctuation marks. All these are the same in ASCII-codes and screen codes, which means that we can write them to the screen unchanged.

From ASCII-64 onwards the two lists diverge: The "A" in a circle is ASCII-64, but screen code 0. In short, for everything that follows from 64 we have to subtract 64 in order to arrive at

the proper screen-code.

This kind of thing is unique to the Commodore range of computers. The reasoning behind it is to be able to have two separate character sets. Set 1 is meant for graphic purposes, while Set 2 is meant for word processing.

Since it is word processing we want to do, we are interested in Set 2 which gives us capital and lower case letters.

Lines 280-290 switch the C64 into the business mode or lower case mode, as it is also called. ASCII-code 14, which is one of those non-printable characters I have mentioned above, is loaded into the accumulator and the ROM-routine at $E716 'executes' the code, meaning in this case, swith the C64 into business mode. You get the same result if you enter the BASIC-command "PRINT CHR$(14)" or press the Commodore and shift key together.

"$E716" is a hex-number. So far I have on purpose avoided dealing with hex, because, unlike other machine code programmers, I do not consider hex an absolute necessity to successful machine code programming. Nevertheless, at a later date I will introduce you to the mysteries of hex too. At this moment just enter the number as it is given in the listing.)

If a key and the shift key are pressed at the same time the "GETIN" routine will return an ASCII code which consists of the normal ASCII code+128. Therefore any ASCII code larger than 128 has to be a capital letter. Anything smaller is lower case.

The Carry Flag

So we want to know first of all if a number in the accumulator is smaller or larger than 128.

This brings us to the second most widely used flag in the PS or flag register; the carry flag.

In simple terms, the carry flag is set if the result of a subtraction does not go, that is, if the result is negative and it is clear if the subtraction goes, that is, the result if positive. Since subtracting two numbers from each other is the arithmetical way of comparing them with each other, the carry flag serves the extremely important purpose of telling us when one number is larger or smaller than another.

If A is smaller than B, carry will be clear. If A is larger than B, carry will be set. Furthermore, if A equals B, carry will be set too.

Where there is a flag there have to be conditional branch instructions testing that flag. By now it will have become clear to you that this is the way we program the 6510 to make decisions. We arrange a certain operation which has an affect upon the flag we are interested in, then we test that flag with the appropriate branch instruction and this makes the 6510 jump to the appropriate routine.

The carry flag is tested and acted upon by two branch-instructions which are "BCC" and "BCS". "BCC" ("Branch if the Carry flag is Clear") asks if the carry flag is clear. If yes, the 6510 branches, if no it doesn't. And "BCS" ("Branch if the Carry flag is Set") asks if the carry flag is set.

Or, to put it differently, "BCC" branches if the number we are testing is smaller than the one we are testing it against. And "BCS" branches if that first number is bigger than or as big as the second one.

In our routine we want to know if the carry flag is clear after it has compared the ASCII code in the accumulator with the value 128 after the "CMP" instruction.

If carry is clear, it will mean that we have a lower case letter, and, as you will discover shortly, in this case it suits us to jump forward.

If carry is set, we've got a capital letter on our hands and want to subtract 64 from it. Then we go into a second test, and if the remainder is larger than 64, then we again subtract 64. The result will be a number larger than 64, and if you look that up in the manual, you will find that in Set 2 that indeed gives us a capital letter.

In a minute it will become clear to you why I subtract 64 twice and not 128 once. First let us look at the subtraction operation itself.

Subtraction

As long as you operate within the 8-bit range of numbers, subtraction (and addition) is quite straightforward on the 6510: You simply put the number you want to subtract from into the accumulator and then give the number you want to subtract together with the "SBC" instruction, which stands for "SuBtract with Carry". The result of your subtraction will then be put into the accumulator. But why subtract "with carry"?

With each subtraction the state of the carry flag is taken into account. Because of this it is prudent programming to use an additional instruction every time we substract.

"SEC" stands for "SEt the Carry flag", and this is one of the few instructions of the 6510 which are used to program the flag register directly. If we didn't do this and the carry flag was clear, the subtraction would be incorrect by one.

So always remember – before you subtract, ensure that the carry flag is set by using the "SEC" instruction!

Addition

Addition is done in the same way, but now you have to ensure that the carry flag is clear. To do this, use "CLC", which stands for "Clear the Carry flag".

Unlike other micro processors the 6510 has no addition or subtraction instructions which do not take the carry flag into account. So, play safe and always set the carry flag properly before you add or subtract!

Both the add and the subtract instructions can be given in all the addressing modes. That is, you can give the number you want to add or subtract immediately or you can tell the 6510 the location, where the number is, in all the various addressing modes which we have described in the last three articles.

In our routine we do it immediately of course because we are dealing with fixed values.

At this point I have to admit that the use of "SEC" in lines 510 and 550 is not necessary in our routine.

Can you guess how this exception to the rule I gave you above comes about?

Well, each time, before we subtract, we test if carry is clear. And if carry is clear it jumps over the subtraction routine. Therefore, when it does the subtraction carry has to be set! So when typing the program in you can omit lines 510 and 550. But remember, in most other situations you can't be that sure and have to use either "SEC" or "CLC"!

In line 530 I compare the remaining ASCII-code again with 64. This is to test if it's a character in the range 32 to 63 or a letter in the range 64 and upwards.

If it is a letter then I have to

subtract 64 again, and now it will become clear to you why I subtract 64 twice in the case of a capital letter: In this way I have a nice flow to this routine, otherwise I would have to make it jump over the second subtraction which costs extra bytes for a jump-instruction.

Having at last arrived at the proper screen code we can now print the character onto the screen.

Print Position

We print the character onto the screen in exactly the same way as we have described in the last article by using indirect-Y.

There is only one major difference: Because of the nature of the program we are writing it doesn't suit us simply to increment the index to arrive at the next position. Instead we prefer to have the exact current position always in "SCREENMEM" and "SCREENCOL". This is useful for when we want to design all sorts of additional input routines, like cursor-left, cursor-right, cursor-up, cursor-down and so on. Using indexed-Y would make it too complicated.

But because of this we have to ensure that Y contains 0 whenever we output a character. This is done in line 600, and you might think that this is not really necessary since we haven't used the Y register anywhere else.

But remember the "GETIN" routine at the beginning! Most ROM routines use all of the registers and thus corrupt them. So we can't take it for granted that Y will still contain 0 after it has returned from the "GETIN" routine.

This is another important point: Always be aware that ROM routines (as well as subroutines written by yourself) use and corrupt registers. So if you need a certain variable, you might have to save it before calling on the ROM routine and restore it afterwards! Of course, in our case we don't have to save Y since we know that it always has to be zero when we print it.

Counting Upwards

The overall gist of our print routine is that we want to print a character to a certain position and then update our pointer-locations ("SCREENMEM" and "SCREENCOL") so they point at the next print-position. Since we write in our culture from left to write the next print position is one more than the former one. In other words, we count upwards.

Again because of the limitations of the 6510 this is not as straightforward as it should be. Sure, as long as we are within the 8-bit range there is no problem. We just increment the location or register by one. But the moment we arrive at 256 it will of course overflow, which means that the location or register notches back to zero.

This is where the high-byte of the number we are dealing with comes in. Every time we reach 256 (or 0), the high-byte has to be incremented by one.

This is not done automatically by the micro processor. It has to be programmed!

So, in line 670 we increment the low-byte of "SCREENMEM". Then we test the zero-flag. As long as the result of the former operation is between 1 and 255, the zero-flag will be clear. Therefore BNE branches us over the following instruction which increments the high-byte of "SCREENMEM".

Only when we reach the crucial 256 (or 0) point will the zero-flag be set. Now it won't branch and the high-byte of "SCREENMEM" will be incremented (line 690).

Lines 710 to 730 do the same thing with "SCREENCOL", and then our routine is finished. We jump back to the "GETIN" routine (lines 720 or 740 respectively, depending upon the high-byte having to be incremented or not) in order to await the next keypress and repeat the whole process.

Deletion

The deletion routine which follows is in a way more straightforward than the print routine. All we want to do is to decrement our print position by one and print a space over the character which we want to delete. (In a later article I will give you a more sophisticated deletion routine which is similar to the one used when you press the delete key normally. But for the time being this one will suffice.)

To start the routine it is prudent to build in a safety catch. After all, we don't want it to be able to go backwards ad infinitum and write spaces into all sorts of locations. So we want to prevent the deletion routine from going over the beginning of the screen.

In lines 820 to 870 I tested the current screen-position against the beginning of the screen, which is 1024. If the two halves are equal, the routine jumps straight back to "GETIN", that is, no deletion-action is taken.

Because I compare two 16-bit numbers with each other I have to do the comparison in two goes. First I compare the two low-bytes. If they don't compare I will know already that it isn't at the beginning of the screen. In line 840 the zero-flag will be clear and it will jump straight to the beginning of the deletion routine.

If, on the other hand, the two low-bytes are equal this is still not conclusive evidence that I am at the beginning of the screen. So I now have to test the two high-bytes. If they too are equal, then I know for sure that it is at the beginning of the screen.

Counting Downwards

Now we want to decrement the screen position by one so that we can print the space and thus erase the former letter.

Counting downwards on the 6510 is even more involved than upwards, if we are dealing with a 16-bit number.

First I load the low-byte into the accumulator in order to test the zero-flag. If the zero-flag is clear, that is, if the low-byte is between 1 and 255, then I need only to decrement the low-byte.

But if the zero-flag is clear, that is, the low-byte contains 0, then I have to decrement the high-byte as well as the low-byte.

Finally

The rest of the deletion routine and the main exit of our program in line 1110 should be clear.

Listing 1 gives you the whole of the program I have described in this article and in figure 1 I give you a list of the instructions we have dealt with in this article and in the last one.

When you try the whole program out you will find that rather irritatingly something is missing: There is no cursor!

Next time I will explain how we can add a cursor to our routine, and an interrupt driven cursor at that. So until then, watch this space – it'll be good.

California Games

If you want sunshine and fun, then look no further than the latest release from Epyx.

By Eric Doyle

In the wake of Summer, Winter and World Games come the Epyx thrills and spills of the sunshine state.

Just when I thought that the Epyx Games series had run its course, US Gold pull a stunt like this on me! For my money California games is the best yet, and that's really saying something. The graphics are radical, the gameplay is varied and the sound...well it's better than the previous games!

Up to eight players can share the experience of the six competitions and each competitor can have a sponsor. Yes folks, Sponsorship has arrived and, when the finished version appears, US Gold hope to have a set of British sponsors.

First of all, dust off your skateboard for the Half Pipe event. As the name suggests this event takes place on the inner surface of an enormous tube cut in half. There are three basic turns you can make to score points: the basic Kick Turn, overhead Hand Plants and super flashy Aerial Turns. The trick is in your timing and speed – go too fast or hold a turn too long and you'll wipe out.





You have just a minute and a quarter to stun the judges with your talent, but fall three times and you'll hang up your skateboard early.

After all this action at earth tremor prone Beveley Hills, we now head for the beach because it's 'Foot Bag' time. Foot Bag? Yes it's the latest craze for macho types. Keep a little baggy ball in the air without the aid of your hands and perform as many tricks as you can for another minute and a quarter.

Surely there can't be that many kicks you can perform? Well there are eleven ways to score and each combination of moves revels in a name such as Dizzy Dean, Jester or Axle Foley. Each combination scores a different mark, the most difficult being the Doda. To complete this move you have to bounce the ball with an outside kick onto your head and then kick the ball back with an outside kick from your other foot!

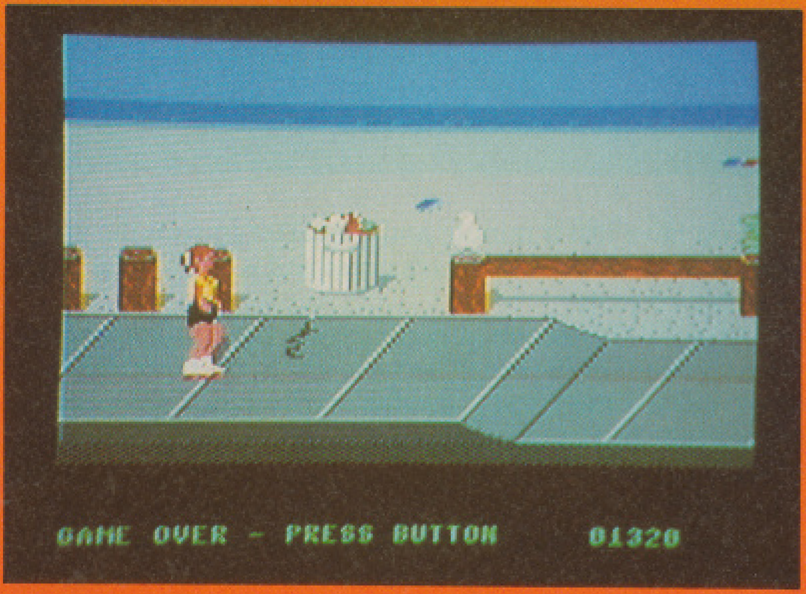
Even California has seagulls and there is one that keeps flying across the screen. If you can hit it with your ball you can score extra points as the bird spins parson's nose over beak with threats of revenge.

After beating your feet on the beach you go on to ride the rollers of the Pacific. 'Surfing' is a passion for Californians and catching a wave is almost a religion. The massive rollers curl as they break forming a tube and it's the aim of every surfer to ride inside the tube. High scores can be achieved for this trick and you can also perform leaps, catch air by just letting your 'woody' overlap the crest of the wave or perform daring 360° turns.



At the end of each turn a group of beach bums offer their opinion of your run and a score is averaged out from this.

'Roller Skating' on the promenades of Californian beaches is hazardous because of all the junk scattered around. In this simulation you have to leap over all of the obstacles thrown in your path. If you have the aforethought and grace to execute a tasteful spin as you jump, your point score is boosted. Beach balls, cracks, uneven surfaces and junk food containers have all to be negotiated before you complete the course.



Did you know that 'BMX' stands for Bicycle Motocross? In this game it also stands for Blue Murder and exasperation! It seems the litter louts have been at it again and the course is strewn with logs, tyres and oil drums. The path undulates into series of whoop-ti-doos and you can wheelie your way along the straights and perform superb leaps from the tops of the highest ramps.

As you jump you can gyrate in one of several ways for lots of lovely bonus points. The most difficult stunt to perform is the forward somersault which can bring a maximum of 6000 points. Compare this with my high score and draw your own conclusions.



By this time a more sedate pastime would be welcome and what have we got? Frisbie or to be more up-to-date: the 'Flying Disk'. All you have to do is to throw it as far as you can and catch it before it touches down. Not as easy as it sounds. First the thrower has to gauge the strength and angle of the shot. Then the catcher has to get into position and catch the disk as it passes.



These are the games and I've spent hours trying to beat my own high scores. To give you something to aim for here are my scores so far:

Half Pipe	3075	Roller Skating	2630
Foot Bag	77500	BMX	5432
Surfing	5.2	Flying Disk	1300

If I had to lose all but one of my Epyx Games disks, I would choose to keep this one.

Touchline:
Name: *California Games.* ***Suppliers:*** *Epyx/US Gold, Unit 2/3, Holford Way, Holford, Birmingham B6 7AX.* ***Tel:*** *021-356 3388.* ***Machine:*** *C64.* ***Price:*** *£9.99 cass/£14.99 disk.* ***Originality:*** *10/10.* ***Playability:*** *10/10.* ***Graphics:*** *11/10.* ***Value:*** *10/10.*

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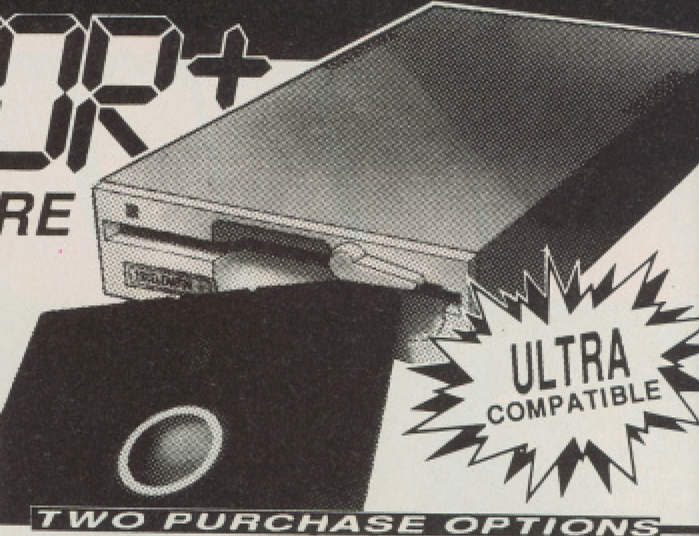
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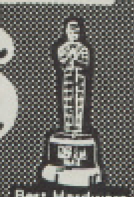
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Bothersome Basic

Continuing our Basic series, the highly strung personality of the Commodore is revealed

By Eric Doyle

One thing that never ceases to amaze me about computers is the way they appear to have intelligence. The more you get involved with programming the more you realise what an illusory phenomenon this is. The simplest way of building 'intelligence' into your programmes is by making the computer appear to respond on a personal level:

```
10 INPUT"(CLR,DOWN,DOWN) HELLO, WHAT'S YOUR FULL NAME":NAME$
20 IF NAME$="" THEN 10
30 ? "OH, IT'S YOU ";NAME$;". I'VE HEARD A LOT ABOUT YOU!"
```

When you type in this program, remember that the characters in the square brackets are not entered as you see them here. After opening the quotation marks, ignore the square brackets completely and hold down the SHIFT key and press CLR/HOME. This will give a reversed out heart shape.

Next, you press the cursor down key to give a reversed out letter Q and then press again for a second Q. When the program runs, this will cause the computer to clear the screen and move down two lines before printing out the question. For more information on these symbols, refer to the *Listings* page in this month's issue.

I have used the word INPUT instead of PRINT at the beginning of the line and so when the program is RUN the computer will know that something will be entered later via the keyboard. After the question, the semi-colon prevents the computer from jumping down to the next line. In response to the INPUT command and the semi-colon the computer will finish off your question with a question mark and the cursor will reappear and flash at the end of the line.

The program is still running at this point but the computer is waiting for a response from the user. We want the computer to 'remember' what is typed in, so we have to tell it to store the answer somewhere. We have seen that the computer stores information as a variable but so far these have only been numbers. This time the variable will be a series of letters.

Variable Questions

For storing such an input, the computer has a special kind of variable known as a string which is indicated by a variable name (NAME) and this is labelled as a letter store by adding a dollar sign ($) after it.

Number variables, or the corrrect term, numeric variables, can be directly assigned in a program (A=125) and strings can also be directly assigned: NAME$="ERIC". Notice that the string of characters is placed inside quotation marks. When a string is INPUT from the keyboard the computer assumes that the response has quotation marks around it, so you don't have to bother to put them in.

After RETURN is pressed the computer checks to see whether something was entered by executing line 20. The IF/THEN command is fairly self-explanatory. If the contents of NAME$ has nothing between the quotes THEN the program will loop back to rerun line 10.

If something has been typed in, the program then executes the final line. This is simply a PRINT statement modified to insert the name in the middle. Once again semi-colons are used to force the computer to keep printing on the same line. To see the effect, erase everything after the first semi-colon and enter two new lines:

```
40 PRINT NAMES $;
50 PRINT ". I'VE HEARD A LOT ABOUT YOU!"
```

After running this to see that the result is the same as before, try erasing the semi-colons to see what effect they had.

Once you have created a string there are special commands which enable you to manipulate it in various ways:

```
10 A$="YOUR COMMODORE"
20 B$=LEFT$(A$,3)
30 C$=RIGHT$(A$,1)
40 D$=MID$(A$,4,8)
50 E$=B$+D$+C$
60 ?A$:?B$:?C$:?D$
70 ?:?:?E$
```

After line 10 sets up A$, line 20 saves the three leftmost characters as a new string, B$. Similarly, C$ becomes the single letter to the extreme right of A$.

Line 40 takes a little more understanding. It tells the computer to save an internal string from A$ which starts at the fourth letter and takes eight characters in all. D$ therefore consists of the row of letters from the R of 'Your' up to and including the D.

Line 50 shows how strings can be added. This is not like adding numbers together, because one string is abutted onto the end of another. It's rather like saying that 2+5+6 = 256! Strings can only be added, using any other mathematical operator other than plus will produce a TYPE MISMATCH ERROR message.

We can use string manipulation in our original program. Add this:

```
21 A=1:B=0
22 FOR C=1 TO LEN(NAME$)
23 IF MID$(NAME$,C,1)=CHR$(32)
   THEN PART$(A)=MID$(NAME
   $,B+1,C-1-B):B=C:A=A+1
24 NEXT C
25 PART$(A)=RIGHT$(NAME$,
   LEN(NAME$)-B)
30 ?"OH, IT'S YOU "PART$(1);".
   I'VE HEARD A LOT ABOUT
   YOU!"
```

Forget line 21 for the moment and concentrate on 22. We're trying to split a full name into forename, middle name(s) and surname. When we write our names we denote the end of one word and the beginning of another by leaving a space between them. If we search along NAME$ for a space we know that all the characters before the space form a part of the full name.

How Long is it?

Several people may use this program, so we don't know how long each name will be. Fortunately BASIX includes a way of calculating this. The keyword LEN will return the length of any string mentioned in brackets after it. We use this in line 22 to determine the parameters in a FOR/NEXT loop which will repeat as many times as there are characters in NAME$.

In line 23 we use MID$ to test each character in turn to see if it's a space. Instead of specifying which character the MID$ starts with, we let the loop do this by using the current value of C, and because only one character is examined at a time we get the expression MID$(NAME$,C,1). If this doesn't equal a space which has a character value of 32, ie CHR$(32), the program ignores line 23 and jumps to line 24. If it is a space THEN several things happen.

First of all a new string is formed. You'll notice that PART$ is followed by (A). As the value of A changes we get a series of new strings: PART$(1), PART$(2) etc. Whis is known as an array. Each string, called an element, in the array has the same string name but the value in brackets denotes that each string is in fact different from all the others. The number in brackets can only range from zero to nine unless we tell the computer otherwise.

When the first space is met A has the value of 1 as specified in line 21 so PART$(1) takes the result of the MID$ expression calculated on the other side of the equals sign. Let's study how this formula is derived.

A space has been found at character number C of the name. This part of the name stretches from the beginning of NAME$ to the character before the space which means the last letter's position is the space's position minus one, that is C-1. For the forename this would mean PART$(1)=MID$(NAME$,1,C-1) so where does the B come in?

Let's see what happens with the second name. Again the last character will be the one before the next position (C-1) but the name starts somewhere in the middle of NAME$. The actual position is the last space position plus one. If we calculate this when we separate off the first name with the expression B=C we can use B+1 as the start of the second name. This makes MID$(NAME$,B+,C-1) but C-1 gives the total number of characters from the beginning of NAME$ to the character before the second space. That's too many, as we only want the number of characters from the last value of C to the current value of C.

Luckily, we have stored the last value of C when we said B=C so if we subtract B from the current value of C we get the length of the second name. This includes the space at the end of the second name, so we still have to substract one, hence we get MID$(NAME$,B+1,C-1-B).

What value do we give B to start with? Remember I said earlier that the first name could be given by the expression MID$(NAME$,1,C-1). If we substitute a zero for B in MID$(NAME$,B+1,C-1-B) we get MID$(NAME$,0+1,C-1-0) which simplifies to MID$NAME$,1,C-1). Eureka! We have the magic formula which covers all cases if B is given an initial value of zero (as specified in line 21).

What happens when we reach the end of the name? Since there is no space at the end the 'IF MID$ is a space' condition is not fulfilled so n o string is set up for the surname. To overcome this we have line 25:

```
25 PART$(A)=RIGHT$(NAME$,
   LEN(NAME$)-B
```

All we have done here is to chop off the end of NAME$ from the last value of C which was stored as variable B. this is subtracted from the full length of NAME$ to give the length of the surname: LEN(NAME$)-B. as the surname goes to the end of the string we can isolate it by taking the RIGHT$ to the length of the surname: RIGHT$NAME$,LEN(NAME$)-B).

Finally, I've modified the last line to address the user by first forename only: PART$(1).

We can now use what we've found to make the computer appear even more human:

```
40 IF A>1 THEN ?"YOU
   HAVE";A;"PARTS TO YOUR
   NAME,";PART$(1);"."
50 ?"GIVE MY REGARDS TO THE
   REST OF THE ";PART$(A);
60?"FAMILY WHEN YOU NEXT
   SEE THEM."
```

This is not a perfect program, so play around with it this month and we'll see how to error trap in a subsequent issue of *Your Commodore*.

A Valuable Utility

Before we jump into the Deep End I have two more things to say. First of all, if you type LIST, long programmes zoom up the screen at a ridiculous speed. Pressing CTRL as it lists does help a little, but the lazy way to get a slow listing is to use this little tip. Type in POKE 56325,1. This does have the side-effect of making the cursor a bit hyperactive but you should be able to type in LIST.

The list will procede at a very low rate of knots and when you want to examine a line you can hold down CTRL and the listing will pause for a long time. To reset 56325 press RUN/STOP and RESTORE. Why spend a fortune on a utility cartridge when it's so easy to slow list?

Finally, I'd like to remind you that any problems which arise out of this series or any general queries about Commodore Basic should be addressed to Bothersome Basic, Your Commodore, 1 Golden Square, London W1R 3AB. If you want a personal reply please enclose a stamped, self-addressed envelope.

In at the Deep End

When you have a lot of screen displays in a program, typing in all those cursor down and cursor right symbols gets boring and confusing. The PRINT AT command is the only thing I envy about Sinclair Basic. You *can* get a similar effect on the C64. First set up two strings:

```
10 FOR A=1TO39:L$=L$+"
   (RIGHT)":NEXT
20 D$="(HOME)":FOR A=1TO24:D
   $+"(DOWN):NEXT
```

If you want to see what these strings look like, run the program and type either POKE212,1:?L$ or POKE 212,1:?D$

Now we can set up a subroutine to pick out the bits of these strings that we need:

```
1000 ?LEFT$(D$,Y):LEFT$(L$,X-1);
1010 RETURN
```

Now your text can be printed at a specific position by stiuplating how many columns across (X) and how many rows down (Y) we want the first letter to appear:

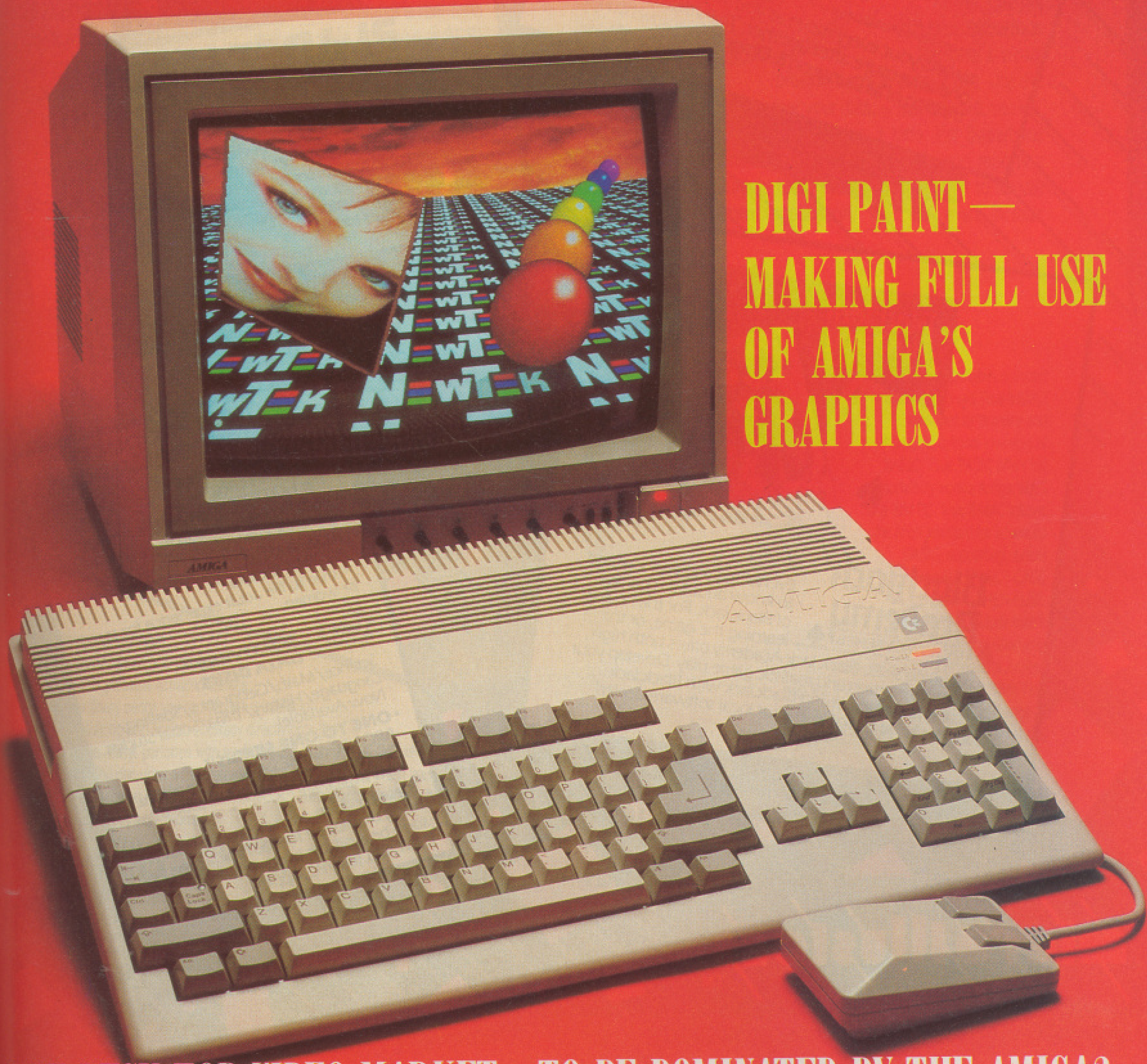
```
30 X=10:Y=10:GOSUB1000
40 ?"TEXT
50 X=25:Y=21:GOSUB1000
60 ?"POSITIONER"
70 END
```

The routine does not appear to be any slower than the usual symbol method, and is alot easier to set up and uses fewer bytes of memory in most programmes.

More Deep End hints and insights in the near future. Get those letters rolling in! YC

YOUR

AMIGA



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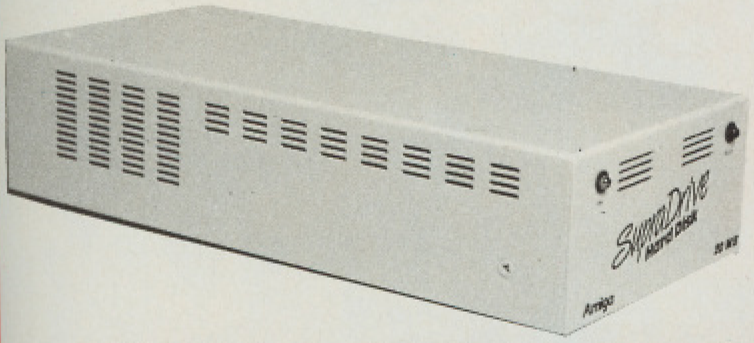
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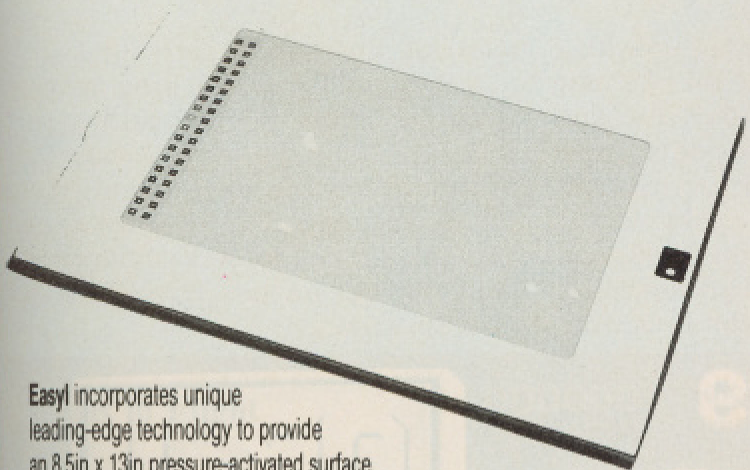
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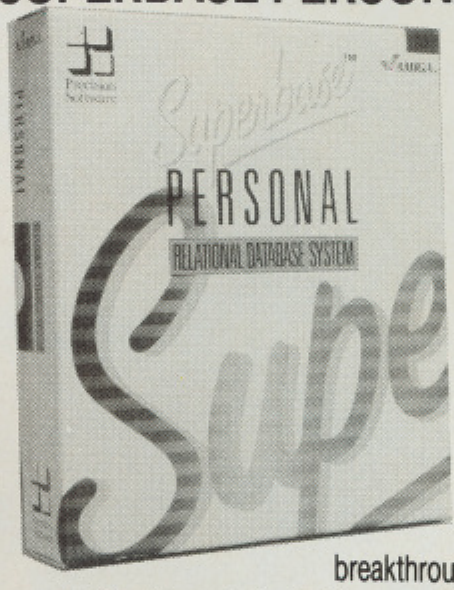
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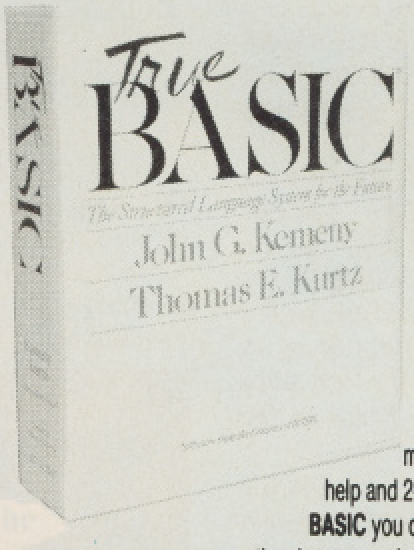
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Amiga News

Expand your RAM

A two megabyte RAM expansion box is now available for the Amiga PC1000 from Robtek. The unit, which retails for £499, is compatible with all Amigas and plugs onto the bus expansion connector. For PC5000 users, a special interface is available for £19.95.

Books and Software Galore

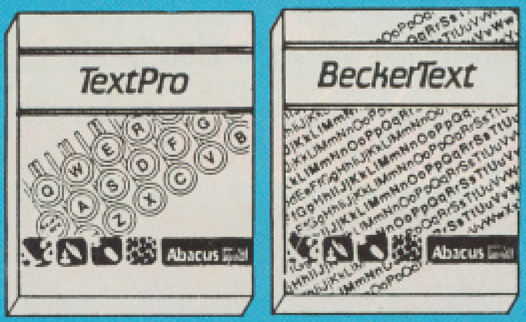
Users of Commodore's A500 and A2000 can now read all about it in four recent publications from Abacus

Amiga Basic – Inside and Out will tell you all you need to know about programming the Amiga in Basic. Approx. retail price: £16.95.

Amiga Tricks and Tips will enable you to program a wide range of the Amiga's features such as accessing Intuition and making use of the advanced graphics programming using windows and menus. Approx. retail price: £12.95.

Amiga for Beginners will give the first time user an introduction to the Amiga and will cover the necessary housekeeping chores and the first steps in Basic programming. Price to be announced.

Amiga Machine Language is the guide for those who program in fast machine language and need to get to grips with the 68000 processor, address modes and instruction set. Price to be announced.



When you've had enough reading, consider the new range of productivity software packages from Abacus.

TextPro is an intermediate level wordprocessor which has been designed with fast entry in mind. The package features fast on-screen formatting, automatic hyphenation, the capability to include graphics with text, 30 user-definable function keys and flexible printer driver installation. Price to be announced.

BeckerText is a professional quality wordprocessor which features the additional functions of WYSIWYG formatting, multiple-column printing, realtime online dictionary for type along spell checking and automatic index generation. Price to be announced.

Data Retrieve is a data management package which features pull-down menus which enable the user to quickly define files and enter information using convenient and flexible screen templates. Price to be announced.

AssemPro is a language development package which contains all the tools for writing programmes in fast machine code. Price to be announced.

Games Update

English Software have come up with a game that could fox the keenest snooker player with *Q Ball*. Imagine playing a pool game inside a cube, lining up shots in three dimensions and being able to rotate the table in 3D while you make your shot. If you feel you're up to the challenge that Hurricane Higgins might even stay clear of, this game is for you!

Rainbird's Level 9 programming team have come up with a three-part fun packed adventure in *Knight Orc*. You play the role of an oppressed orc in a magical world of illusion and deception where you will communicate with other characters, learn spells and solve puzzles.



English Software's Q Ball



Level 9 Celebrating Knight Orc

Turn me On

A useful utility for Amiga users is an ON/OFF switch for the A500, which allows the power supply unit to be placed well away from the computer, allowing freedom of movement around your computer. The existing power inlet is simply plugged into the A570 switch and then the whole unit is plugged into the power socket – what could be easier? Price at £14.75, the switch is available from Lifetime Products, 22 Winston Avenue, Stocksbridge, Sheffield S30 5LA.

Forms in Flight

The Amiga Centre in Scotland continues its policy of importing some of the most interesting graphics software for the Amiga from the USA. The latest addition to its catalogue is Forms in Flight; a 3D drawing and animation utility. Objects can be drawn in both two and three dimensions and can then be viewed from any perspective or direction. The objects can be moved or rotated about any point to create animated effects with pan, roll, magnify, multiple light sources and hidden line removal all possible. But watch out, you will need 1Mbyte of RAM minimum to work this magic.

The £60 inclusive price tag is reflected in a large spiral bound manual and a highly professional presentation. The software is menu driven. Playback supports low resolution with 32 colours and medium and high resolution with 16 colours. Plotters understanding the standard Hewlett Packard drivers can plot the objects, which are maintained in libraries, on paper. Details on 031 557 4242.



Forms in Flight

Games Galore

The Amiga is looking more and more like the natural successor to the C64 with a flood of new games available. MicroProse have promised us Moebius, a fantasy role playing adventure and Anco's 'budget' (in Amiga terms) range of £9.95 games is the first indication of more reasonably priced software.

Advertising Avalanche

Commodore are promising the computer trade an Amiga 'advertising avalanche' this Christmas. Advertising in the trade press has spelled out the advantages of the Amiga 500 over any rival home computer so there should be no shortage of shops to buy an Amiga from over the holiday period.

How do I get it?

It's alright us giving you an exotic address and ZIP code for some Los Angeles neighbourhood but how do you get the software? Well, you can either:

1. Check the ads – English Commodore dealers are importing more and more software all the time.
2. Try our contact addresses/telephone numbers.
3. Get in touch with Commodore UK who can supply you with a brochure full of goodies for your Amiga.

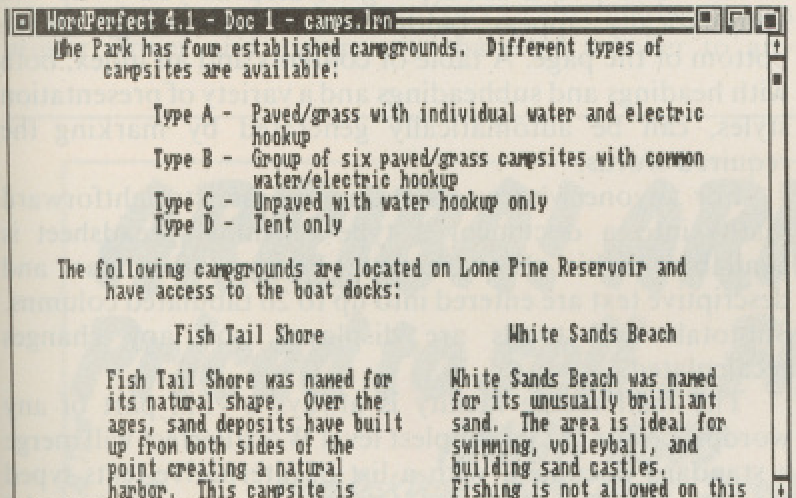
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Club Amiga, 85 Upper Drumcondra Road, Dublin 9, Ireland.
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English Software, 1 North Parade, Parsonage Gardens, Manchester, M3 2NH. **Tel:** 061-835 1358.
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CONTINUED IN JANUARY 1988.

WordPerfect

We take a close look at what could be the ultimate word processing package for the Amiga.

By Anne Owen



The persuasive professionals from Sentinel Software recently took me through an extensive demonstration of WordPerfect, a wordprocessor whose functionality no other Amiga software package can match so far. The finished product should be available from your local dealer by the time you read this.

I had heard about WordPerfect on the IBM PC, the best selling wordprocessor – 15% of the UK market. I heard that Sentinel has target sales of three million pounds this year (you will have no trouble getting a £ sign on this wordprocessor – see below). I heard that WordPerfect was becoming a standard, number one in the charts, used *en masse* by Marks and Spencers no less.

I also heard that on the PC WordPerfect 4.2 costs £425 but that Sentinel employ twice the staff supporting WordPerfect users than selling it to the non-WordPerfect users. The Amiga version is WordPerfect 4.1 and costs £295. I also heard that there is an educational price of £76 for training (£135 for administration departments).

WordPerfect Family

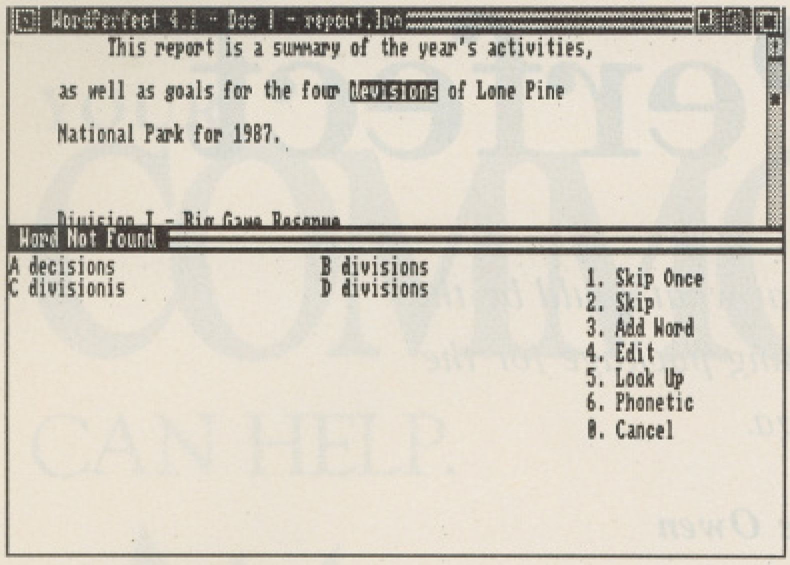
Sentinel are lucky, selling WordPerfect and the associated family of software products in the UK is 'fun' for them. Everyone in the company uses them and looks forward to the next package from across the Atlantic. The latest Amiga version of WordPerfect arrived to great excitement while I was visiting. If the Amiga family (especially the 2000) does well, then we Amiga users can also look forward to more software from the Utah based WordPerfect programmers. Current products include a spreadsheet and database.

WordPerfect Amiga takes its place beside Atari ST, Apple Macintosh and IBM versions in the PC field. The Amiga 2000 can, in particular, take advantage of the text file compatibility between different computer types. At the recent Commodore show, Sentinel had both Amiga and IBM versions running side by side in the 2000, one in the Amiga, one in the MSDOS task window. When you buy WordPerfect on the Amiga, you buy a product which is available on almost everything, including DEC VAX and PC networks.

Working with WordPerfect

WordPerfect has got every 'standard' feature you would expect of a wordprocessor. Each feature is accessed via pull-down menus and submenus – all with alternative (function) key presses – with all choices offered on screen. For instance, on selecting a search and replace on formatting codes, all the codes are listed on screen for you to choose. You are not expected to remember them or look them up. Substantial help texts can also be called up to explain any operation.

No requirement therefore to start with the manual whereas the more advanced features can be learned by using the tutorial disk and the manual together. WordPerfect, unlike some packages, is fully in tune with the Amiga environment. Just click on the disk icon, then the WP icon and you are into the full-screen text window, which can be



sized and scrolled like any other. A number of document windows can be open at the same time. The function keys are surrounded by a printed template with colour coding for the different key press combinations, e.g. SHIFT and function key. In this way a key can, say, activate a word count or go to a page number.

The programmers have cut down disk access to a minimum, meaning fast retrieval of file information. This is displayed in a window with ten options listed alongside. Files can be marked for selective operations such as delete, copy or printing (which is in the background from this window – in other words you can continue wordprocessing). 'Info' files are available but can be suppressed from the WordPerfect display. Files are sorted alphabetically and can be searched for a word match. They can also be protected by password. An 'ASCII check' provides a quick way of displaying the contents of a file.

The retrieve option adds the selected file to document so standard texts can be merged. Each document is held in 'virtual memory' which means that the text can be as large as disk storage will allow with text loaded into memory as required without intervention by the user. WordPerfect periodically makes a backup of your file in case of accident but documents also have to be saved at the end of a session.

Editing Text

Before describing some of WordPerfect's editing abilities, it is necessary to explain that each document has two elements. For each text that is visible on screen, there is a second text 'below' with formatting codes included. This second text can be displayed in the bottom part of a split window and can be edited in the same way as the 'top layer'. The codes look like this:

(Margin, Set:0,74)
(C)
(HRt)
(Tab Set:L15)
(TAB)

and affect the text after them until the next equivalent command takes precedence. As required, the user can get to know them and take precise control of the text at low level. For the great majority of the time these codes will be inserted invisibly as you edit a document, choosing linespacing, centring, justification, hyphenation and so on. All style and formatting features can be generated with the mouse or from the keyboard. Differing line lengths, simply adjusted on the ruler, tabulation and bold and italic styles are shown on screen

Modifications to the text can be made by character, word, paragraph or marked block. Rectangular blocks can be copied, deleted or moved cut and paste style. As well as editing text over a single line length, you can type into columns across the page. The columns can be protected or 'newspaper style', where the text flows from the current column into the next column to the right of it.

Advanced Facilities

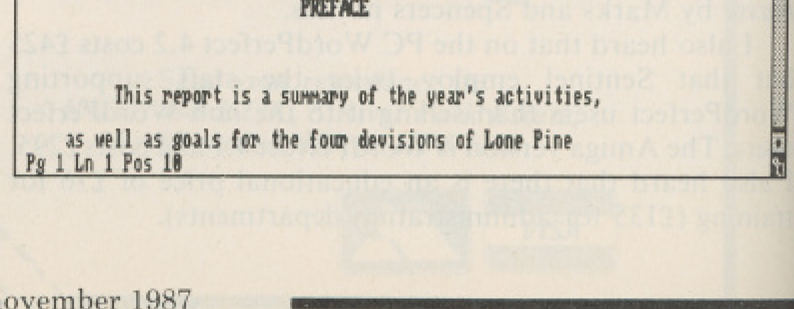
WordPerfect is plainly for the Amiga user who processes large amounts of text. For the product catalogue, information booklet or book, an automatic outline facility is available. Once activated, each paragraph is assigned a new number. Each new tab position gives a new level (and style) of numbering. There is a large range of styles to choose from, for instance IV, 1, A, a.

Each page of WordPerfect document can have its footers and headers and a footnote generated as you write will automatically appear (with correct formatting) at the bottom of the page. A table of contents and an index, both with headings and subheadings and a variety of presentation styles, can be automatically generated by marking the required words.

For anyone who wants to incorporate straightforward maths into a document a type of mini spreadsheet is available within WordPerfect. Figures, formulae and descriptive text are entered into up to 26 tabulated columns. Subtotals and totals are displayed and any changes recalculated.

The mail merge facility is always a vital part of any wordprocessor. At its simplest level WordPerfect will merge a standard document with a list of alternative texts typed into WordPerfect itself. WordPerfect uses a set of special merge codes which are prefixed with ' ^' (CTRL). ^R indicates a record end in a merge list for instance, ^Q halts the merging process and ^C takes text direct from the keyboard. Text can be merged from a primary and secondary file with the results going to the printer or a disk file.

Macros repeat off-used keystrokes and WordPerfect will



record a set of keypresses like a digital tape recorder ready for replaying at any time, for instance from within a merge file. You must call the macro by the name you choose for the definition.

Spell checking has become a standard feature of modern wordprocessing. WordPerfect can check by document, page or marked block. If an error is detected then likely replacement spellings are offered for a quick click of the mouse. The checker can also pick up double words and numbers in words if required. A supplemental dictionary can be created from words unrecognised by the main dictionary and there's a program module to add it to the main dictionary if required. Foreign language options are available. The thesaurus compliments the dictionary with a vocabulary broken down into verbs, nouns, adjectives and antonyms (opposites). You can quickly move around alternative possibilities by clicking on them with the mouse.

Output

Printer features such as font, pitch, lines per inch super and subscripts, though not displayed, can be specified by codes in the text. The 250 printer drivers, as well as making Preferences look stupid, mean that, whether you use dot matrix, daisywheel or laser, there is in all probability a simple setup procedure for you. You can also build your own printer driver and assign any character number to any printer code. For instance you can assign the Amiga internal character code 163 (the £ sign) to the code which generates that character on your printer.

Sophistication

For me the sophistication of WordPerfect is reflected in this sort of attention to detail: when you mark a block of upper case text and turn it into lower case, WordPerfect will, by default though not necessarily, retain upper case characters at the start of any sentence within the block. Marvellous! And if you get anything wrong there are three levels of 'undo'.

There are none of the desk top or form drawing features of some specialist wordprocessors, but WordPerfect appears to provide sophisticated and well-directed facilities without leaving the user behind. My brief acquaintance left me impressed and pleased that the Amiga's potential is beginning to be fulfilled by ambitious software, the power of which I have only been able to hint at in this article.

Availability

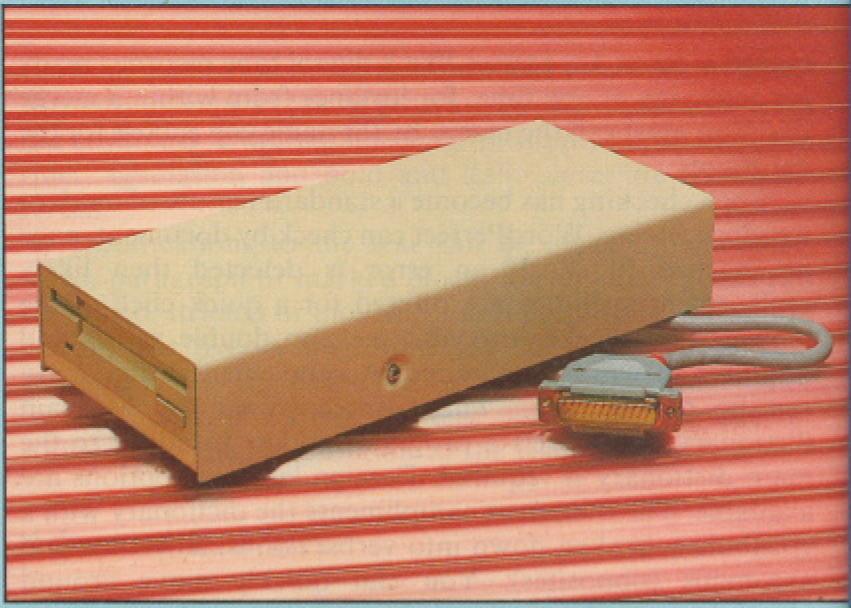
WordPerfect Amiga is version 4.1. It comes on four floppy disks with manual and keyboard templates. Price is £295. The Amiga Users Group is offering a £50 trade-in discount for Scribble! users who wish to upgrade to WordPerfect.

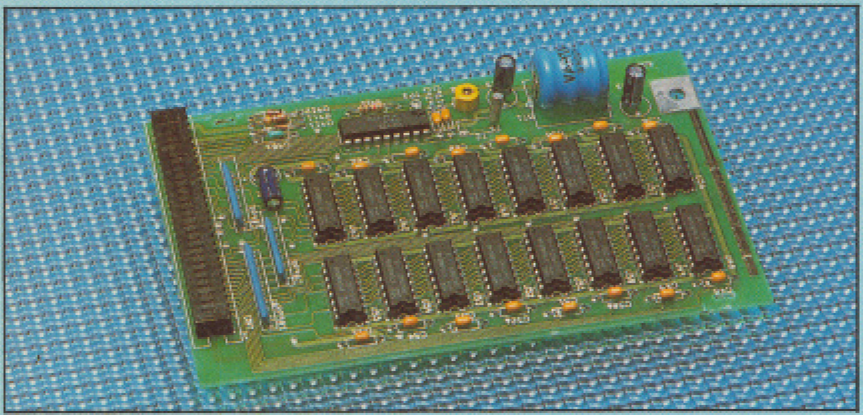
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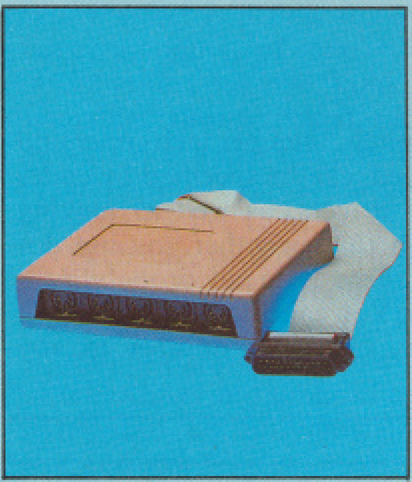


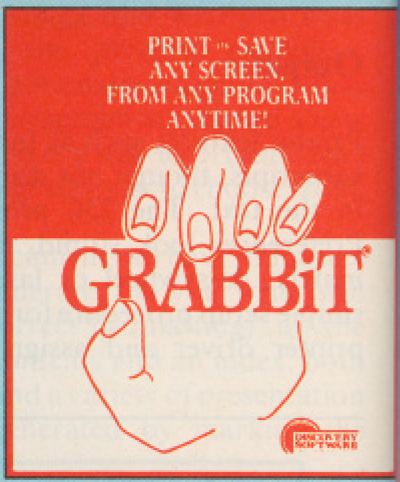


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Amiga Games

Another batch of games for the Amiga, old favourites and hot new properties jostle for places inside Your Amiga.

Cruncher Factory

Do you remember Pac Man? That seemingly easy game where you controlled the movements of a yellow, ball-shaped mouth that ate and ate and ate...?

After Asteroids, Pac Man was probably one of the first arcade games to make it big Stateside; it is probably the only arcade with a children's cartoon series to its name (thank God), and after setting off a whole genre of chase-orientated spin-offs, Pac Man sank into obscurity, occasionally popping up here and there in seedy motorway cafés.

Well, this time Pac Man has surfaced on the Amiga; called Cruncher Factory, this is not only Pac Man with all the bells and whistles, but it is the first Pac Man I have ever seen with the option to have two players playing at the same time!

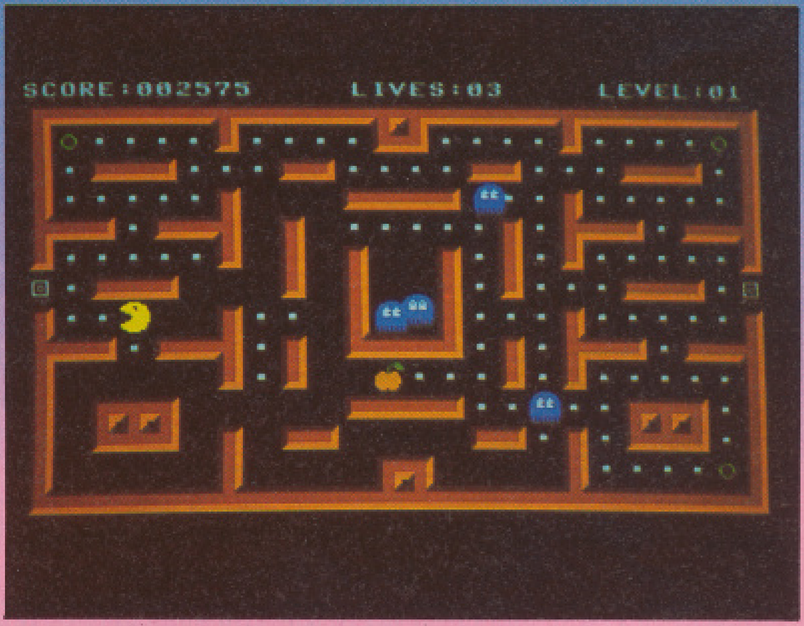
The cruncher moves about the screen, eating the little dots and the larger green dots, which work as power pills, enabling you to eat the monsters for a short period of time. Sometimes a fruit appears and can be eaten for bonus points (unless the monsters get it first).

However, Cruncher Factory has a great deal more than its name might suggest. Because the Amiga has bags of memory, Anco have added features such as Random walls appearing in the middle of the game (often hemming you in at the last minute), 30 different and increasingly wicked mazes, and the option to design another 70 of your own!

These days, maze designers are becoming increasingly popular in games of this genre, and in the case of Cruncher Factory, it stops it becoming just another version of Pac Man. Now you can create mazes made up of your own name, or you can draw shapes, or you can even have an empty screen full of dots, with just the monsters to get in the way!

The maze designer uses the screens above level 30 for your own designs and while designing them can be a time consuming task, it is well worth the effort, as creating 70 original and interesting screens to play, or to pit your friends against, while the two-player mode, gives great satisfaction (especially if they can't finish the screen7 as well as keeping the game from getting boring.

Other features include the ability to knock down the small walls that appear during the game, as well as being able to turn the monsters into Atari symbols (you can then add a little insult to injury by turning yourself into an Amiga 'bouncing' ball... now it gets personal!)



It's not that Cruncher Factory isn't an enjoyable game, it's just that without these little extras, Cruncher Factory would be just another Pac Man rip off, good for perhaps a few games. thankfully, Cruncher Factory is insanely addictive and I can't stop booting the disk up whenever I have a free moment to spare.

If you are looking for Pac Man on the Amiga, then this is a reasonable game; it doesn't make the most of the Amiga's graphics capabilities, but none the less, it is enjoyable.

C.G.

Touchline:
Name: *Cruncher Factory.* ***Supplier:*** *Anco, 35 West Hill, Dartford, Kent DA1 2EL.* ***Tel:*** *0322 92513/8.* ***Machine:*** *Amiga.* ***Price:*** *£9.95.*
Originality: *3/10.* ***Playability:*** *7/10.* ***Graphics:*** *5/10.* ***Value:*** *7/10.*

Karate King

This game is a karate 'simulation' where the Amiga is used to create some stunningly beautiful backgrounds. Against which, you create utter mayhem while you battle it

out either against the computer as the Red Fighter, or 'between friends', with an opponent.

The mouse is not used with this package, and a joystick is required for all sixteen moves. The Amiga handles the graphics with such ease tht the red fighter seems to almost sweat as he lunges at you with some pretty nasty kicks.

The sound effects are very good, with sampled shouts and cracks, and a few good groans as well. The problem is that I don't really know what I am fighting for! The immediate aim is fairly simple though – to knock the red fighter unconscious so that you can move onto the next screen.

After each bout there is a short interlude as some unseen opponent throws boulders at you from the sides, which have to be demolished before you can move onto the next screen, and exactly the right move is required to shatter these into pieces.

This is a good combat game, with some very clean graphics and some nice music to boot (pun intended). All nine screens are beautifully presented and although the game is very difficult in the first three or four screens, it does not get as difficult as would be expected after level six has been reached.

The joystick in port two controls the white fighter. The red fighter has the advantage of being more powerful than the white fighter, and at higher levels he also has various killing devices at his disposal, including shuriken, throwing darts and so on...

As you progress, it seems that some types of punches are more effective than others. For instance in the first level, you can use just about any blow you wish, but in the second level a kneeling punch or a low kick seems to work wonders!

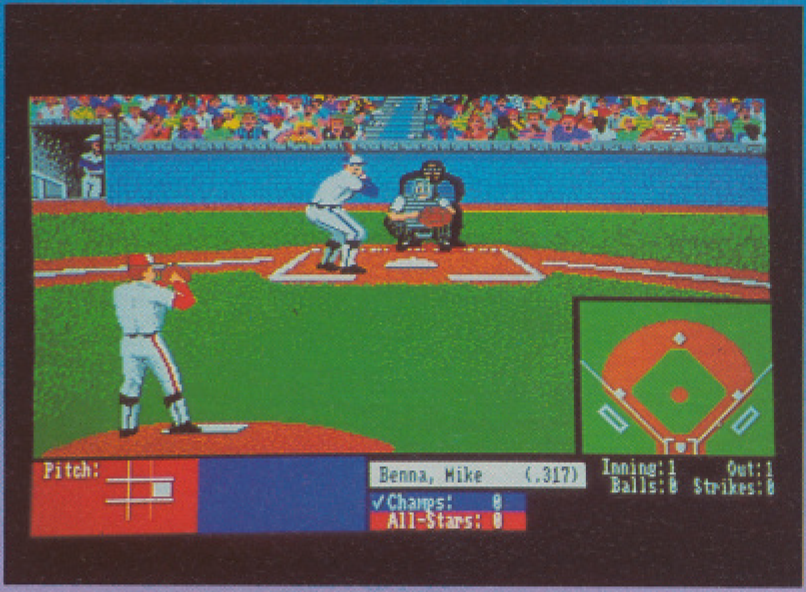
If you are defeated by the red fighter, a couple of birds fly over you and your opponent (probably still comatose on the floor) with a banner proudly proclaiming his superiority. They fly off and it's time for more mutilation and mayhem... all good clean stuff.

Karate King is the best version of this sort of game I have seen running on any machine and the ease with which the Amiga presents each movement forces envious looks from all the non-Amiga users I have played this game with. This would make an ideal first time purchase for any new Amiga owner wanting some hack and slay software to while away a cold evening.

C.G.



Touchline:
Name: *Karate King.* ***Supplier:*** *Anco, 35 West Hill, Dartford, Kent DA1 2EL.* ***Tel:*** *0322 92513/8.* ***Price:*** *£9.95.*
Originality: *7/10.* ***Playability:*** *7/10.* ***Graphics:*** *9/10.*



Hardball

Imagine you are in the good old US of A and you are at a major league ballpark just before most of the fans have arrived. The sun is shining and the hot dogs have been cooking all summer; you find yourself a seat with a good vantage point (let's say just behind the batter) and you sit down ready for the day to begin.

Accolade Software have really gone to town on the packaging for this one. Hardball is a game that has not only captured the essence of a major league baseball game, but I believe, will successfully make the transition from America to Britain with consummate ease.

Hardball – in America – is a game that is played on a pitch like rounders, using the scoring of cricket, and has the popularity of football; add to this the tactical strategy of a small (and paranoid) South American country with a large nuclear arsenal, and I think you'll get the gist of this slice of American pie.

So, kitted out with baseball hat, a six pack (of cherry Coke) and my Amiga, I booted up the game and prepared myself for a whole new experience.

First of all, you are given the option to use either a mouse or a joystick. You can play Hardball against the computer, against friends or even set the Amiga to play against itself!

From here on, you are going to have to know a number of things. Firstly, you are going to have to know how to play baseball. This isn't too difficult, as the game is essentially the same as rounders (i.e. hit a ball and run like hell!) but unlike rounders, there us an umpire behind the batsman who decides whether or not the ball is in the 'strike area' (for more information, just see the hilarious 'Bad news Bears' film which is, incidentally, all about a bunch of losers in the league, and you'll soon pick up on how things work in the game).

Another thing you will have to know is the ability of the

team you are currently waging war against. The tips in the back of the handbook are reasonably useful – should you happen to know baseball jargon – but the best way to get to know an opponent is to see how he reacts to a pitcher's throws, and this is where pen and paper come in useful.

Play begins with the pitcher's screen, depicting the pitcher, the batter, and the well-protected umpire. You are looking from the centre field and are able to control either the 'Champs' team or the 'All Stars'. If you are the team batting, you simply decide which is the best type of strike to attempt (don't forget you don't have to try to hit a ball – if you don't think you can hit it, the umpire usually agrees with you!).

You give the ball a great big whack and you run around the pitch, passing as many of the bases as you can. If you get there before the ball, then all is well; if you don't, then you are out, and the crowd squeal in delight – nice to know where your friends are!

Pitching is even better! You select which is the best (or rather worst) throw for your opponent (i.e. can you get the ball past him three times, with the umpire calling 'strike' each time?). If the batter hits the ball, the screen clears to display the field, and the ball slowly arcing over to one of your fielders. You, with mouse in hand, then take on the role of fielder and move the closest player to meet and catch the ball, and then throw it on to the next base on from the runners – like rounders, you are to try to get the ball there before the runner, and so catch him out.

The attention to detail is amazing! In the corner of the screen is a Bazooka Joe, propped up against a wall eternally blowing gum. The crowd murmurs excitedly between pitches, and cheers wildly whenever anything gets hit. The sound as the bat strikes the ball is very realistic – a wonderful 'crack' that could have inspired Sir John Betjeman's 'sound of leather on willow' quote.

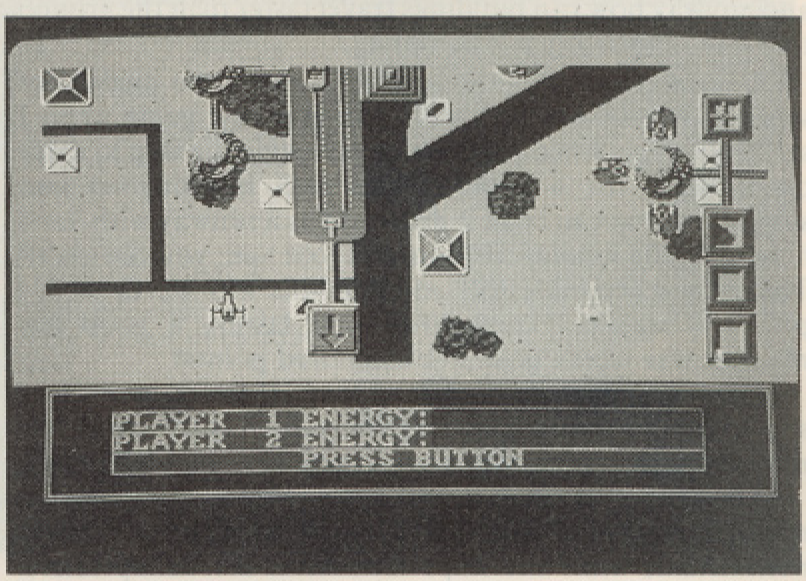
The animation is very smooth, especially when pitching the ball, or when you are batting; and when the scene changes to the field, you can run about with the selected fielder flashing on and off until he throws the ball. As a batter races against an approaching ball, they slide into base in a cloud of dust and gravel... great stuff!

Substitutions are easily made, should you find a man beginning to wear under the strain of being active in the field for too long, and should you work out the playing tactics of a pitcher or batter, then you can improve your chances of beating him by selecting a more suitable opponent, so there's quite a bit of thinking to be done as well as playing.

Hardball is an amazing game; it is delightfully free of violence, and it has captured not only the competitive spirit of the game, but also, I believe, the atmosphere of the ballpark, the excitement of the crowd and the smell of those lovely sizzling hot dogs!

C.G.

Touchline:
Name: Hardball. ***Supplier:*** *Accolade, 20833 Stevens Creek Boulevard, Cupertino, California 95014.* ***Machine:*** *Amiga 512K.*
Originality: *9/10.* ***Playability:*** *8/10.* ***Graphics:*** *8/10.* ***Value:*** *9/10.*



Challenger

Another one of Anco Software's 'silver' range of software packages for the Amiga. The aim of the game is to collide as little as possible with the objects at the upper (grey) level and the lower (green) level on the screen. Player one uses a joystick, plugged into port two, which is used to control the speed at which the green background scrolls past and determining the rate at which the blue ship moves forward. The computer, (or player two) controls the rate at which the grey background scrolls past, as well as the flight of the green ship, if played in 'two player' mode.

The players pilot their space ships and try to avoid colliding with either the landscape or the grey level, as each impact causes an energy drain. If the way ahead is clear, you simply accelerate, hopefully causing your opponent to collide and explode. the upper level is filled with a latticework of anonymous, nondescript grey buildings, occasionally labelled 'land here' (you can't), the lower with trees, shrubs and more small buildings. After the third, 'underwater' level, the game improves a little – but not much, and certainly not enough to distract you from wondering how the spaceships got underwater in the first place.

Challenger is essentially a 'dodge out of the way' game with eight different levels. The problem is that there is very little substance to the game, as all that you are doing is dodging out of the way whenever an obstacle in the lower or upper levels approaches. A basic explanation or scenario of the type often found in accompanying novellas might have relieved this, as at least there might be an underlying goal. As it stands, twelve lines of instructions are clearly not enough.

Instead, the game revolves around the one (or two) spaceships, which are controlled by joysticks; note that neither the mouse nor the keyboard are used here, which is unusual, and annoying, in that not all users will have joysticks for their Amiga, and this will seriously limit the game's appeal.

Playing the game is a rather unenjoyable and boring affair as you are simply avoiding the trees and bushes and the various ground based buildings, while keeping an eye out for

the upper 'grey' level buildings that seem to sweep past you, and anyway how can buildings travel faster than the ground they are supposedly supported by?

One interesting aspect of Challenger is the method of scoring. For instance, I was starting a new game when I suddenly abandoned the joystick, allowing the ship to carry on unaided for a short while, until it ploughed into something that can be best described as a runway with 'land here' proudly emblazoned on it (I told you, you couldn't)! The high score table told me that this was worth 64,334 points, whereas a controlled flight lasting a good few minutes was worth only a few hundred points!

Now either I'm going crazy, or there is something seriously wrong with a scoring system that takes absolutely no account of flying, dodging or tactical skills whatsoever!

Playing against the computer is even less enjoyable, as nothing new happens. The sound effects are virtually nonexistant, while the ships themselves are unimpressive. They consist of one dimensional objects that do not fit in with the otherwise well-designed graphics, nor do they look anything like the ship in the loading screen. Even the explosions are unsatisfying!

The loading screen provides something of an anticlimax in that the long list of credits seems to promise more from the game than it actually delivers. I am well aware that this is a low price game, but the waste of the Amiga's facilities is reprehensible, although Anco have proved, with games such as Karate King, that they can provide excellent software for this machine, that utilises its capabilities to the full. Software of this ilk usually tends to be restricted to free distribution among user groups and public domain libraries.

All in all, I would give Challenger a miss, unless, of course, you have money to burn.

C.G.

Touchline:
***Name:** Challenger. **Supplier:** Anco, 35 West Hill, Dartford, Kent DA1 2EL. **Tel:** 0322 92513/8. **Machine:** Amiga. **Price:** £9.95.*
***Originality:** 2/10. **Playability:** 3/10. **Graphics:** 4/10. **Value:** 4/10.*

Brian Clough's Football Features

Well the Americans have had it their way with Hardball but CDS Software have converted a popular program across to the Amiga which offers a little bit of English culture for this primarily American machine.

Brian Clough's Football Fortunes has the unusual approach of being probably the world's first computer game that plays side by side with a board game. It is suitable for two to five players and each player takes on the role of a football club manager.

The object of the game is for each player to successfully steer his team through the season, using his skill to make the team stronger as the games proceed. Each manager competes against both human and computer controlled teams in a ten-strong first division for the league championship and, of course, the FA Cup. From the second season onwards, each team will compete towards the European competition, through the usual practice of league champions going through to the European Cup, the FA Cup winners going through to the European Cup Winners Cup, and the remaining clubs going on to the UEFA Cup.

The winner of Brian Clough's Football Fortunes is the manager who survives to the end of the game and has the highest number of game points. Game points are those awarded by the computer and are based on each manager's performance in the league cup competitions, and on the amount of raw cash he has managed to accrue and, more importantly, retain, by the end of the game.

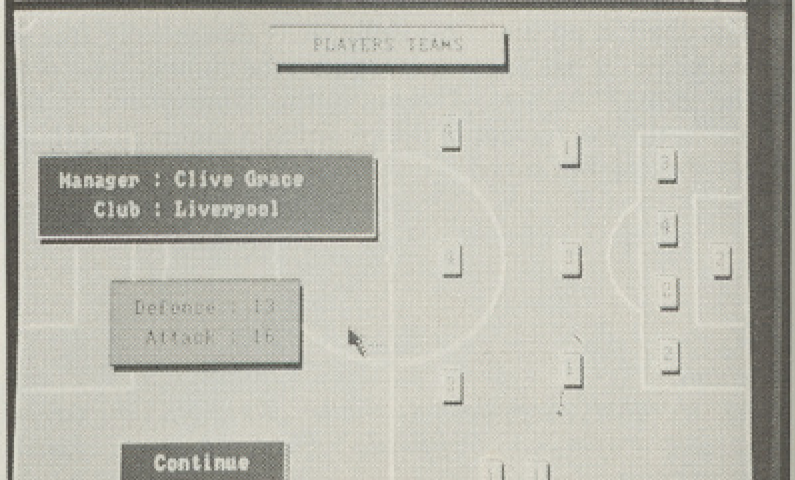
Sounds familiar? You bet it is! Brian Clough's Football Fortunes is simply a well presented and very enjoyable variant of the old board game of Monopoly. The main aim of the manager is to create as strong a team as possible, by increasing the star rating of his side. However while doing this, he must not neglect any section of the team or he will lose matches, nor must he overspend as the scales of fate sometimes tip unfavourably – often at a time when you could really do without the extra hassle.

Ah well, such is the stuff of which football managers are made, and if you can look after your bank balance while retaining your star players, then you could go far.

Footballers are purchased from other football managers and a player can also obtain star material from Auctions. this must be done shrewdly and with skill – yes we would all like a world cup goal scorer in our teams, but unless you can survive buying him, and you gain the results you expect quickly, then you may just as well have thrown your money down the drain, as a foolish purchase can cost you your job – and nobody knows more about getting the boot than Brian Clough!

The game is more or less managed by the computer, but don't think this is a quick 30 minute-to-play job, as playing Brian Clough's Football Fortunes can take anything from a couple of hours to a whole afternoon, depending on how many people are playing.

The computer doesn't do all the work for you; it provides lists of forthcoming fixtures, the current league table, details of points scored by both clubs and managers throughout the game and the chance cards allotted to players, as well as the all important printout of results on the screen at the end of each league game. This is in the same way that the results are presented at five o'clock every Saturday afternoon during



the football season, but you do need to look after the way cash is spent, as well as making sure that the pitch does not fall into disrepair and that occasional refurbishments are made as required.

After each match, the manager can receive his gate money from the banker. He will be given half of the amount shown by the monitor, and the size of the gate receipts depends, of course, on the league positions of the teams playing any given fixture. For example, playing a top flight team could be a big pay-off for all concerned, if the two teams were well matched. However, if you are scraping around the bottom of the league, then I wouldn't recommend breaking the bank trying for the summer tour of South America!

This is an excellent strategy game – probably one of the best of its genre as it requires methodical thinking and almost brutal planning ahead, but then that's life at the top!

Brian Clough's Football Fortunes is also an unusual game in the way that it brings the players together more than if it were, say, a completely computer orientated game. The graphics are nothing special, being mainly rather chunky – but colourful – menus, but then managing a football team gives you more to think of than mere frivolities.

Full marks must go CDS software for their packaging of Brian Clough's Football Fortunes; the 'funny money', the cards, the board and the instructions all come together to make an excellent package – perhaps not family entertainment, but a great way to amuse your friends for an evening. Oh, and if you should have any problems regarding the game, there is a special Brian Clough's Football Fortunes hotline set up by CDS software. Now that's what I call dedication!

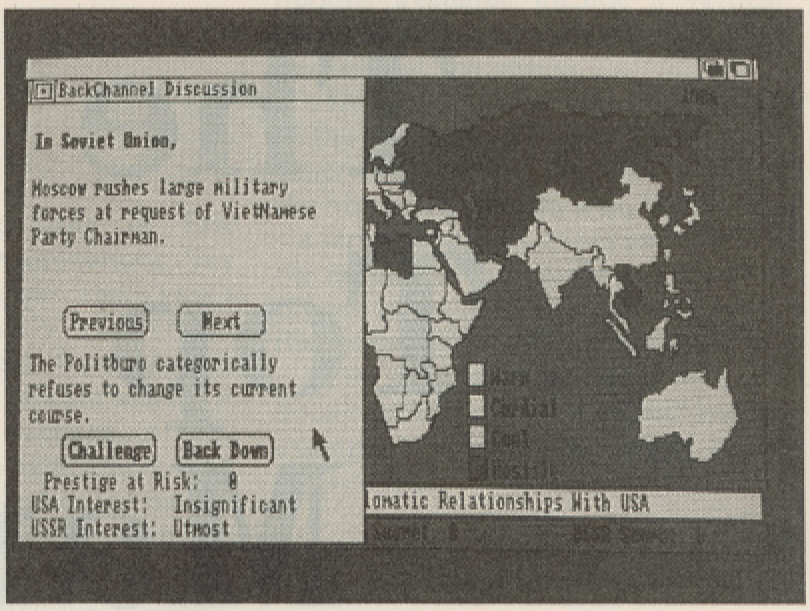
G.C.

Touchline:
Name: *Brian Clough's Football Fortunes.* ***Supplier:*** *CDS Software Ltd, CDS House, Beckett Road, Doncaster, DN2 4AD.* ***Tel:*** *0302 21134.* ***Machine:*** *Amiga.* ***Price:*** *£24.95.*
Originality: *7/10.* ***Playability:*** *8/10.* ***Graphics:*** *5/10.* ***Value:*** *7/10.*

Balance of Power

If you enjoy a mental challenge, against human or computer opponent, then Balance of Power, Mirrorsoft's Mindscape strategy game of geopolitics, will not disappoint. The game puts you in the shoes of the American President or the General Secretary of the Soviet Communist Party. Your judgement and temperament will determine the outcome of an eight-year long cold war. The object is to win prestige and influence in the global sphere, without instigating a holocaust – the ultimate failure in B of P. A score is maintained and can be viewed at any time.

Each year you support insurgents against the enemy as well as political allies under threat, with both economic and military aid. These hotspots are where each oppoonent can throw down the diplomatic gauntlet and may begin a crisis. You must decide when to back down as well as when to stand firm.



The local scenario will be recognised by anyone who reads the foreign news in the paper. Indeed B of P has its own newspaper reports, as well as private information sources on minor countries and on the super power combatants. USSR and USA actions for each current round (a year in game terms) and for past years is also available.

This variable information is combined with a large collection of static data about all the 'countries' represented on the B of P maps. The maps are what make the game; offering information quickly and attractively in association with pull-down menus. It is fun just cliking the mouse on different countries to gather information about the economy, population, GNP and military spending. There are details on education, health, violence in society and political inclination. Data goes right down to the number of televisions or telephones per capita.

Your first eight years of negotiations is just for beginners. The intermediate grade introduces the subversion of foreign governments, Coup d'Etats and the new policies of economic aid and destabilisation.

The expert level introduces treaties based on diplomatic, trade or military co-operation and the pressures that can be brought to bear by large on small through these means. The aim here is to prevent the 'Finlandisation', i.e. going over to the other side of the allied countries. The 'nightmare' level is the same as expert but with the odds shortened for the human player against the computer or for one side in the two player game.

B of P requires a well presented manual containing plenty of background to the game and its underlying rules. It's a tough game to play and its detailed design is enthralling. And it doesn't matter which side you choose, only a cool head and the ability to learn from your mistakes will see you through.

This is another highly priced software package but I won't complain because there are hours of enjoyment here in a very nicely produced game.

A.O.

Touchline:
Name: *Balance of Power:* ***Supplier:*** *Mirrorsoft, Athene House, 66-73 Shoe Lane, London EC4P 4AB.* ***Tel:*** *01-377 4645.* ***Machine:*** *Amiga.* ***Price:*** *£39.95.*
Originality: *7/10.* ***Playability:*** *9/10.* ***Graphics:*** *8/10.* ***Value:*** *8/10.*

The Desk Top Video Market

By Anne Owen

Many people believe that the Amiga is going to dominate the Desk Top Video (DTV) market in the way that the Apple Macintosh has cornered Desk Top Publishing. Software packages are emerging which allow microcomputer graphics and video to combine powerfully, both at professional and amateur levels.

3D on TV

Aegis, already renowned for their graphics software, such as Animator, on the Amiga, have released the $199.95 VideoScape 3D graphics and animation package. Aegis are pitching it against expensive professional software like Digital Art's DGS system and Cubicomp Corp's PictureMaker.

A minimum of 512K is required to generate 'television quality graphics', although Aegis suggest 2Mbytes and a dual drive system or hard disk. The software consists of Designer 3D, created by Colin French, for making 3D objects; PlayANIM, created by Gary Bonham of SpartaFilm, for playing animations back in real time; and VideoScape 3D, created by Allen Hastings, for making finished videos. Thre are also utilities for creating common geometric shapes such as spheres, cones, rectangles and fractal landscapes.

3D objects are created either by numeric entry of X,Y,Z co-ordinates or by one of the supplied utilities or by point and clock with the mouse. With D3D, there are three windows representing front, side and top views of the object. Scaling, numeric value display and numeric entry help maintain accuracy as the object is drawn. When finished, a motion file can be loaded and the object is passed to the preview window. In real time, the object can be shown in motion from all sides. Each frame of the motion file is recorded in RAM and played back at an adjustable speed.

Once the objects are created, they are loaded into VideoScape's main control panel. Here, the scenes are put together. Details regarding camera and object motion, backgrounds, foregrounds, horizon and other information are determined, and a complete scene is created. At this point a video cassette recorder can be hooked up to record the scene one frame at a time, or a few seconds at a time using the PlayANIM module. Frames can be previewed either manually or automatically at any time, and their settings can be changed on the fly.

To create an ANIM file requires at least one megabyte, although they will play back in 512K. An ANIM file can compress a 40K frame into less than 1K. Jeff Bruette, computer graphics expert and Richard Lewis, production designer for Max Headroom, are using Videoscape 3D to create background logos as well as some on-screen wire-frame animation for the well-known show. So watch your screens.

Animator's Apprentice

Animator: Apprentice software, written by Hash Enterprises is designed to generate frames for animation in 4096 colours. The Apprentice costs £195.00. Two dimensional images are turned into 3D sculptures by 'Sculpt'. Character movements, called 'actions', are defined with another interactive module and are applied to the objects in 'Director'. Here characters are positioned, the light source and camera focal length set and the scripts written.

Each frame is generated automatically, taking between five and twenty minutes (which is quick!). When finished the frame can be recorded to video. Playback of frames in near real-time on the Amiga is also possible.

Animator comes into the category of organic animation and is strong on representing people and animals with naturalistic shading. It is for the budding Disney who wishes to put together story-telling with characters rather than logos, fly-bys or mathematical shapes.

Martin Lowe, of the amiga Centre Scotland – who market Animator in the UK – has distributed what must be the definitive list of software requirements for Desk Top Video:

1. Extensive graphics and sound capabilities.
2. Genlocking capability (for mixing video and computer graphics).
3. Overscan (no screen borders).
4. Real-time playback so that editing can be done on home video recorders.
5. A titler program

6. A HAM (hold and modify) in 4096 colours paint program.
7. A Video digitiser for inputing pictures into the computer from a video camera.
8. A 32 colour paint program.
9. An 'organic' 3D animation program.
10. A 'mechanical' 3D animation program.
11. A special effects program (wipes, screen splitting, etc).
12. Other animation programmes which perform specific feats (such as water, clouds, mirrors, etc).
13. A mouse or tablet for artistic input.
14. An editing video recorder.
15. A 2D animation program.
16. an audio digitizer.
17. A music program.
18. A sound synthesis program.

I'm sure you can identify some of the software and hardware above; the majority of which is now available for the Amiga. If you have ideas of your own about combining Amiga and VCR don't keep them to yourselves, drop us a line. A professional setup with all the above would cost an arm and a leg. At home you can start out with some good animation software with real-time playback, a home VCR to record the screen and a cable to plug them together.

Ray Tracing

Following the popularity of Eric Graham's Juggler animation, ray tracing could become this year's computer fad! Eric's ray tracer software is available from Amiga Centre Scotland, but beware because it isn't an animation package, it only generates a single frame at a time. Eric is working on an animator for his ray tracer generated images but in the meantime just putting together your own picture is a fascinating exercise.

To create a picture, the positions, size and colours of the spheres and lamps (light sources) have to be defined in a data file. The program ssg processes the input file, puts the resulting image on screen and sends it to a specified output file. The finished files can be more rapidly displayed by the ss program. This is just as well because the original takes an age. In fact one of the useful options you can set from the command line when you call ssq is the picture size. A small, and more quickly generated, version can be used to check your input data. Other options available include a vertical format picture and anti-aliasing (blurring at the edges).

The input file contains the position of the observer, the direction that the observer is looking, the focal length of the observer's camera lens, the objects – a series of spheres, tubes and chains – the number of lamps, the specification of each lamp, the colour of the ground, the diffuse illumination and the sky.

The software is supplied with full documentation, some finished and an example ray tracer file ready to be worked on.

Summary

The software mentioned above ranges in prices and power. You can try your hand at ray tracing from £11.50 – why not send us your results to share with other Amiga owners – or you can invest heavily in DTV by purchasing both Genlock hardware from Ariadne Software and programmes such as Videoscape – for 3D – or Animator – for organic – animation. I can't wait for the first Your Amiga video!

Amiga Promise

Now, there's no excuse for poor spelling, and that's a promise!

By Anne Owen

Promise by 'The Other Guys' is a stand-alone spellchecker for the major Amiga wordprocessors, boasting a 95,000 word dictionary, a spelling helper and a punctuation checker. How do these features match up to the task of keeping your copy clean?

Because spell checking is a necessary evil rather than an entertainment, I am happy to say that Promise does not mess around. A simple file display with click/requester boxes for drives and directories is used to select the file for checking. In a similar fashion 'custom' dictionaries (those you have created yourself) can be loaded into RAM, where they merge and are used in tandem with the main dictionary to check the selected text file.

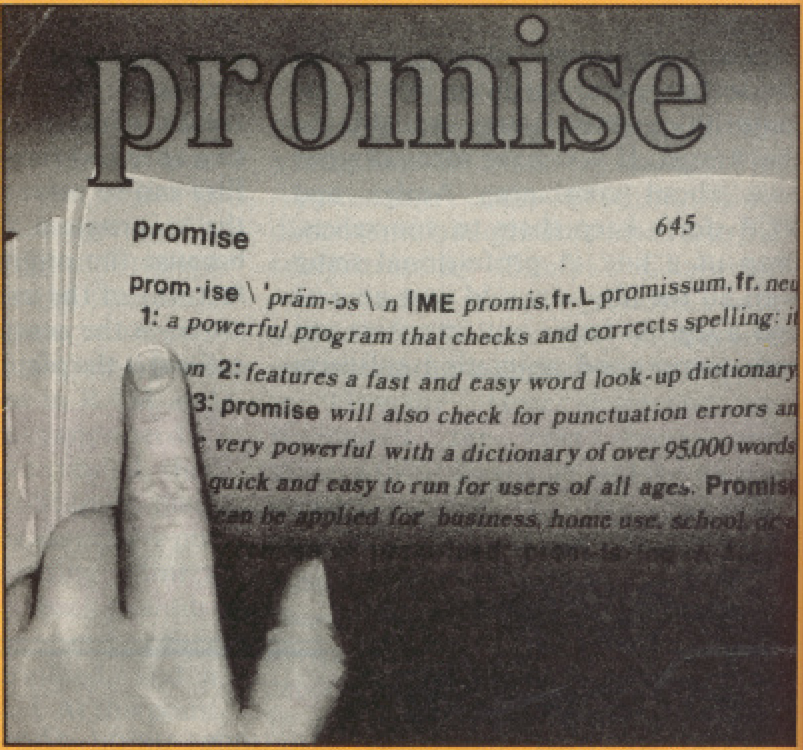
When activated, Promise rapidly detects any words unknown to it (not necessarily incorrect) and prompts you to either correct the spelling or go on checking. You can specify whether any change or ignore should apply 'just this once" or for 'all occurrences'.

Any word which is unknown to Promise can also be added to the custom dictionary which can then be saved in its amended form for later use. When correcting you can make use of the 'help with spelling' feature. You just click on one of a number of suggested words which are listed in Promise and your selection is exported as the correction.

The 'Spelling Helper'

A close relation to the above is the separate 'spelling helper' which can be opened as a task on its own and used while writing (or doing a word puzzle, crossword, etc). You can look up spellings and words using wildcards in place of the letters you are unsure of, e.g. pr????? finds all seven letter words beginning with pr; rec??ve will find the correct spelling receive; * is substituted for any part of a word, e.g. p*c*t*ry which is unknown. Great for Scrabble cheats!

The punctuation checker works alongside the spellchecker when activated and finds punctuation which does not correspond to its basic rules. A correction is suggested which can be accepted or refused as with spelling. Promise checks for double punctuation marks (usually a typing mistake), lack of a space after a punctuation mark, commas and full stops outside quote marks and colons and semicolons inside quotes.



I discovered to my surprise, that our review version of Promise did not operate correctly with Kickstart 1.2 or 1.3. Only my old 1.1 on the A1000 got me going so check with Robtek, the UK suppliers (01-847 4457) on compatibility with your system before buying. If you can get going then Promise is excellent for batch checking files and really comes into its own when instantly available in its own hard disk directory. The manual explains each operation, including backing up and hard disk installation in a step by step manner so there is no room for misunderstanding.

Because wordprocessors/text editors like Textcraft, Edit or early Scribble do not have spellcheckers of their own, Promise can do a good job filling the gap, though at a fairly high price. Prowrite files have a number of codes embedded in them so Promise is not really suitable. If you use Scribble! II or have invested in WordPerfect then Promise offers nothing over and above the excellent checkers you already possess.

Touchline:
Name: *Promise Spellchecker.* ***Supplier:*** *Robtek Ltd, Unit 4, Isleworth Business Complex, St. John's Road, Isleworth, Middx.* ***Tel:*** *01-847 4457.*

Book Review

There's no need to be bogged down with heavy reading when you're learning about the Amiga. A recent publication from Ariadne seems to have provided the answer.

By Clive Grace

The Amiga is to many people a closed machine; there are no advanced reference manuals readily available to the first time user, and the massive four volumes of the 'Technical Reference Guide' published by Addison Wesley is considered heavy weight reading matter and is really only suitable for the machine code programmer who is already adept at programming in the Amiga's native tongue.

The 'Kickstart Guide to the Amiga' is, by contrast, a smaller tome. Published by Ariadne Software, this large format paperback book has 250 pages and contains so much information, I had to put the book down every ten minutes to stop myself getting overwhelmed by the sheer mass of information.

The Kickstart Guide is written from the point of view of the serious software programmer who has, for the first time, delved into the world of 16 bit computers only to be confused by the extra memory and facilities that the Amiga has over other machines in its caste.

The book is roughly divided into three sections; part one is an introduction to the Amiga, and I couldn't wish for a more comprehensive introduction to the general hardware. It satisfies the craving for more information after devouring the BASIC reference manual and the Amiga 'Welcome' manual for the first time.

The opening chapter serves to explain the 68000 processor, its interrupt handling facilities and its rather over-indulgent register handling system. The introduction explains how the 68000 fits into the Amiga's working environment and where necessary, it pulls comparisons from the more familiar world of the 6502 processor, so users upgrading from their C64's or C128's will find it easier to understand the complex interrupt facilities the 68000 has to offer.

The second section is divided into five smaller sections, and attempts to explain I/O streams, how to access various devices and setting up a few virtual ones of your own. This chapter goes on to setting up multitasking operations finishing off with an intriguing chapter called 'Serial port debugging, and the Joy of Whack' – sounds like fun!

Have you ever wondered what those numbers are at the end of the 'Guru Meditation' message? The Kickstart Guide not only tells you how to translate them, but also explains when an error is an operating system crash, a hardware fault or an applications bug, and there are ways of retrieving information after the Guru has meditated. Ommmmmmmm.

The Amiga's famous graphics capabilities are uncovered, possibly for the first time, and the book goes even further by discussing how the graphics can be more freely accessed through the Amiga's 'copper' co-processor hardware, and introduces us to the special custom chips named 'Paula', 'Angus' and 'Denise'. These chips can be used to obtain beautifully fluid computer animation by synchronising the blitter and bimmer chips to the screen 'flyback state'.

The third section is an introduction to 'C', and promptly pushes you off at the deep end into programming with arrays, strings, data pointers and all of the most useful things you will need when programming in a new language for the first time.

While this section does not purport to be a definitive description of 'C', I would, however, recommend this section to programmers wishing to sample the delights of this powerful programming language for the first time. It does jump ahead of itself at times, but with a little note taking, many of the initial questions regarding 'C' are answered. Interestingly enough, the style of the manual becomes less chatty, underlying Ariadne's serious commitment to the 'C' language.

There are quite a few examples in 'C' short enough to go through without resorting to buying a 'C' compiler, but as many of the serious programmes and games are written in 'C', it seems sensible to think of 'moving up' to 'C' at some point or another.

In all, 'The Kickstart Guide to the Amiga' is competently written in a friendly style without too much rambling on about how 'amazingly wonderful the Amiga can be, if only you could program the damn thing.'

The most important thing about this book is that it is written in a style that is very alluring, moreover, it inspires confidence in the programmer and while this initially leads to a few monumental mistakes, it also puts you on the road to experimenting with the Amiga, which is a good deal more interesting than just pushing the mouse around your desk... although that can be fun as well.

This is an excellent book and necessary reading if you have an Amiga; be it a 1000 on A500 or even the A2000. If you are thinking of getting an Amiga then this book may just tip the balance, I can't imagine what my Sunday afternoons were like before this book!

Touchline:
Title: *The Kickstart Guide to the Amiga.*
Publisher: *Ariadne Software Ltd, 273 Kensal Road, London W10 5DB.* ***Tel. 01-960 0203. Price:*** *£12.95 (£1 p&p).*

ProWrite

New Horizons have come up with a wordprocessor with a difference – ProWrite offers colour, high resolution and graphics in text.

By Anne Owen

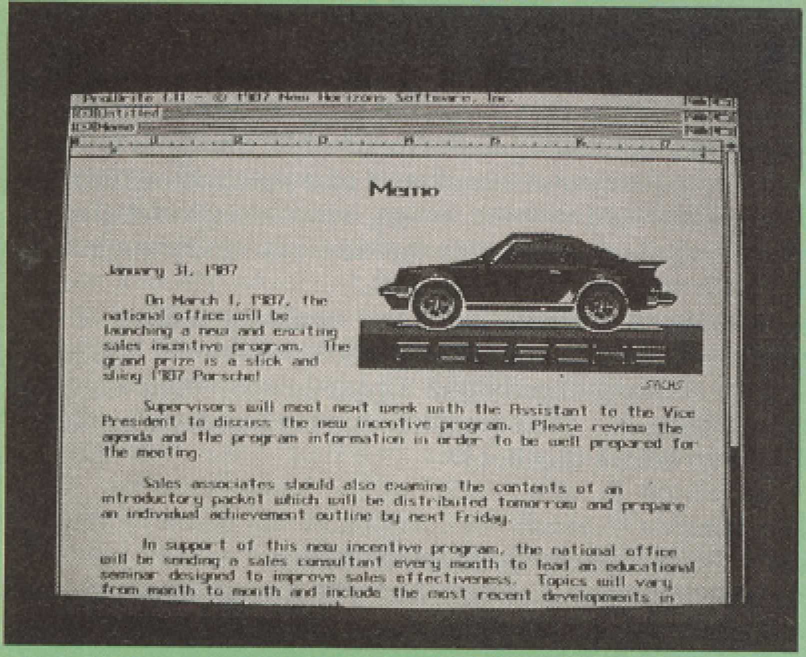
First impressions are always good with New Horizons software, the packaging and manuals are up with the best for any micro. ProWrite's 'fold flat' manual is especially friendly, pitched at the beginner but with full index, glossary and feature by feature explanations. Request boxes and menus are printed alongside text for ease of recognition and there's a beginners' tutorial incorporating one of the three examples of text on the disk.

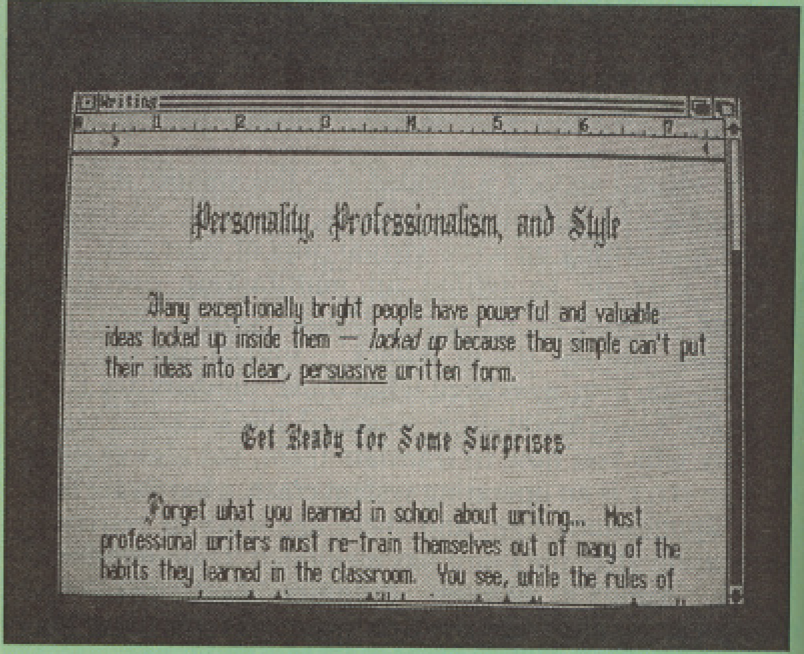
Different breed

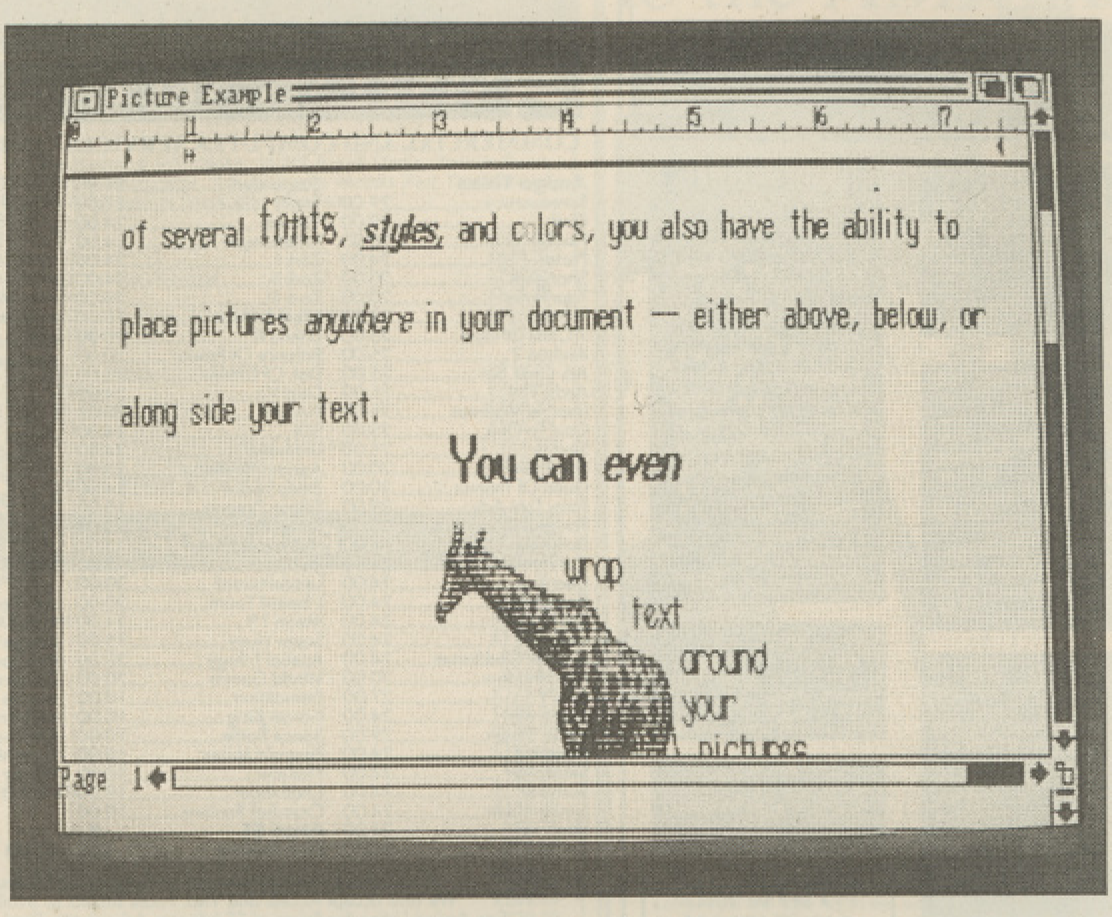
ProWrite is different enough from any rival software to prompt the question 'what do you want from your wordprocesor?' Personally I decided I wanted high resolution (interlace mode) but I couldn't cope with the flicker on my 1080 monitor. ProWrite's default background colour is paper white and a dimmer (SHIFT/HELP) is provided with cuts down flicker a little. Also recommended is the product Jitter-Rid, a screen which fits over the monitor but I didn't get the chance to test this out. The best and most expensive answer is the Commodore 2080 long persistence monitor. I soon renamed the medium resolution version of ProWrite as my default ProWrite to boot up into.

I also decided I like colour on screen. There are seven to choose from, corresponding to the seven ribbon colours available on a colour dot-matrix printer. The standard fonts and three others, Granite, Marble and Serpentine (12 point on 15 point only) can take any of the colours, different colours for alternate characters if you really want!

In combination with a colour printer and colour photocopying, ProWrite can be an effective specialist wordprocessor for the editor/designer of promotional print, children's worksheets (colour is a very effective tool in education), overhead transparencies (depending on the printer again), indeed any presentational material in which text is a vital element.







Of course you can print out from ProWrite in black and white, draft, NLQ or standard. If you wish to print out on a daisywheel then topaz 11 point has to be used to get the correct formatting. Standard here means a graphics printout which reproduces the fonts on screen as well as the italics, bold, subscripts and so on. Colour is nice but it's expensive to deliver on paper.

No Doubt about Graphics

Without qualification I welcome ProWrite's ability to combine graphics and text. ProWrite allows you to cut out a rectangular block of IFF graphics, created in a 'paint' program. This is achieved by opening a second document and loading the graphics. At this stage you are prompted to choose the degree of shading to apply to the graphics, full, partial or none. The choice depends on the picture and the printer. Once 'cut', the graphic appears in the top lefhand corner of the text document in which you 'paste'. You can then move the graphic around the document to wherever it looks best. Text can take on the background colour of the graphic which creates a very impressive feature when printed.

Unlike a program such as GEMwrite, ProWrite lets the text flow around the graphics box, it doesn't have to stop above and below. You can even type into the spaces in the picture.

I have begun to experiment with clip art: dinosaurs in the background of a draft letter to the bank manager; fun things like teddy bears – I suppose it should have been he-men or gobots – on children's stationery. Graphics can also be used to impress. A 3D graph from Aegis Impact! can nicely explain (away) some figures. Even the figures themselves saved as an IFF file (via Zing! or Grabbit!) from Analyse! can be used as a table. Company logos, letterheads and standard artwork can also be created and used over and over. ProWrite allows them to be incorporated into displayed footers or headers.

Standards

ProWrite lets you have a number of documents open at the same time, each in its own window which can be sized or placed in the background or scrolled. Text can be moved or copied between windows. Each layout is controlled by the margins, indents and tabs set on the ruler at the top of the document. Settings apply to individual paragraph blocks (defined as text between presses of the RETURN key). The markers for these blocks can be made visible for editing purposes and a format can be copied between paragraphs blocks.

As you type, ProWrite wraps the text according to the selected format, e.g. justified, centred, double-spaced, etc. ProWrite indicates page breaks as they occur. Footers and headers are entered via a menu option with a number of page numbering styles to choose from. They can be displayed on screen if required and there's an option to turn the header (and footer) off for the title page.

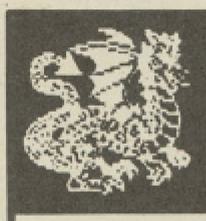
The pull-down menus give a good idea of the more standard features of ProWrite. The search and replace operation is particularly friendly through the use of on/off buttons and check boxes with which you can set the exact search pattern you require. The keyboard shortcuts, the keyboard equivalents of pull-down menu options, some of which are on function keys, are also vital for the regular user.

Summary

I very much enjoyed using ProWrite. Although it does lack a spellchecker and supports only Preferences printers, and you can't print marked sections of a document, only a minimum one page. The £100 plus price tag makes it an unlikely buy for the beginner, which is a shame because ProWrite is very easy to use. ProWrite can achieve the more ambitious print projects you may have in mind, which its rivals cannot. In respect of graphics and colour ProWrite is out on its own, but is it also ahead of its time or your hardware budget?



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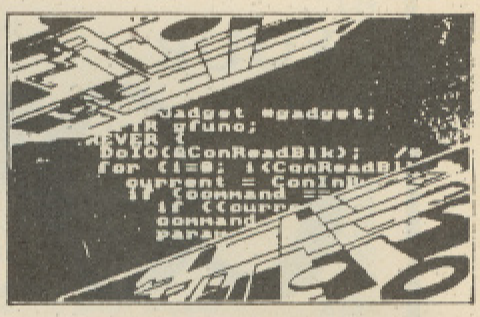
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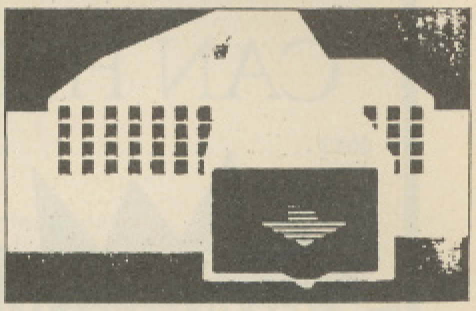
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The 'Kickstart' Guide to the AMIGA







When Commodore sent out the first issue of "Kickstart - the European Technical Journal" it was hailed as the first thing to explain the machine in a way which was comprehensible to a human being, instead of just to another Amiga!

The Commodore Amiga is probably the most advanced wide-market Microcomputer ever produced, both in terms of hardware, and in terms of the system software. The Amiga uses a state-of-the-art message-passing multi-tasking Operating Environment - while this is responsible for a lot of the machine's power, it is also a rich source of confusion to programmers used to comparitively primitive micros.

Aware of this, Commodore commissioned Ariadne to produce the "Kickstart" journal, which was distributed to all European developers. Particularly well received were a series of feature articles, which explained the key concepts of the machine in a way which didn't assume you knew about them already, and which were designed to complement the official documentation as much as possible.

Now with the release of the A500 another group of programmers are eagerly approaching the Amiga. Ariadne have therefore taken the feature articles from Kickstart, revised and updated them, and added new material appropriate to a wider audience - the result is this book.

The 'Kickstart' Guide to the Amiga....£12.95

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The definitive Word Processor for the Amiga. Pro Write can do all the things professional word processors can do, and that have been unavailable for the Amiga until now. features include:
IFF graphics can be included in documents * Large range of fonts available
Mix text and Graphics together in colour * Accented characters
copy text between upto 8 open text windows * and a great deal more...

Prism
Prism is the first graphics programmes on the Amiga that allows you to use the mode "Hold & Modify" allowing you to use 4096 colours on screen at a time! Ideal for touching up those digitized photos!

Starboard
THE Memory board for Amiga. Not only does the starboard have a through connector and come in 512K, 1Mb and 2Mb versions (supplied with or without chip), and can be upgraded, but with the addition of the Multifunction module you can have all these extra features:
68881 (Maths processor) socket * Battery backed clock
"Sticky" RAM (keeps your RAMDisc or programmes when you reset/crash the Amiga) * Parity Logic

Karate Kid II & Goldrunner
Two of the most successful arcade games on the ST are now available on the Amiga.
Karate Kid II is the best karate game on any home computer and the animation is stunning.
Goldrunner is noe legendry for the speed of its scrolling landscape. Wonderfully detailed back-drops and fantastic sound add up to making this the most challenging, most compulsive game or the Amiga to date!

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M P C Software, 72, Julian Rd., West Bridgford, Nottm. NG2 5AN. Tel:0602 820106/455114

Digi Paint

Stretch the graphics capability of your Amiga to the full with this up-market arts package.

By Clive Grace

The Amiga is, as everybody knows, a stunning graphics computer; it has enough memory set aside for all but the most demanding of applications and to make life even easier, there are a number of screen 'modes' offering various resolutions and colours suitable for various applications.

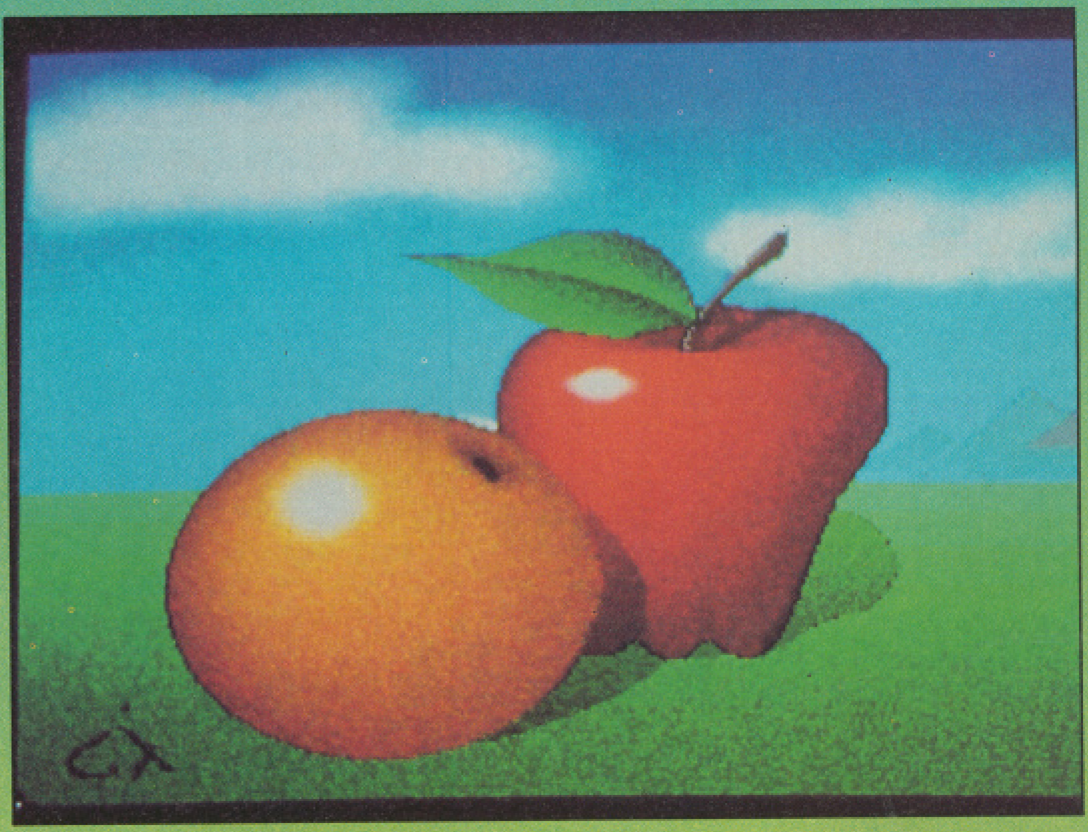
The Amiga can display a maximum of 32 colours, which can be logical colours, or shades of any particular colour, i.e. black and white 'grey scale' colours.

One of the least understood and most underestimated of the screen modes available on the Amiga is the 'hold and modify' video display mode. Initially it was considered something of a curiosity, enabling colour palettes to be shared on the screen at the same time. To the best of my knowledge, no package has yet used this facility to the full.

With the HAM mode, the Amiga can display all of the 4096 colours at the same time, which is no mean feat. And when you consider the many hours that have gone into the programming of this new screen mode, it is amazing that the software was finished at all!

Introducing Digi Paint

Digi Paint is a new software package which is quite frankly, comparable to professional graphics workstations which cost many thousands of pounds. Digi Paint is capable of working in, and displaying, very high resolution pictures using this HAM mode, in both the 320 x 200 and the 320 x 400 resolution modes.



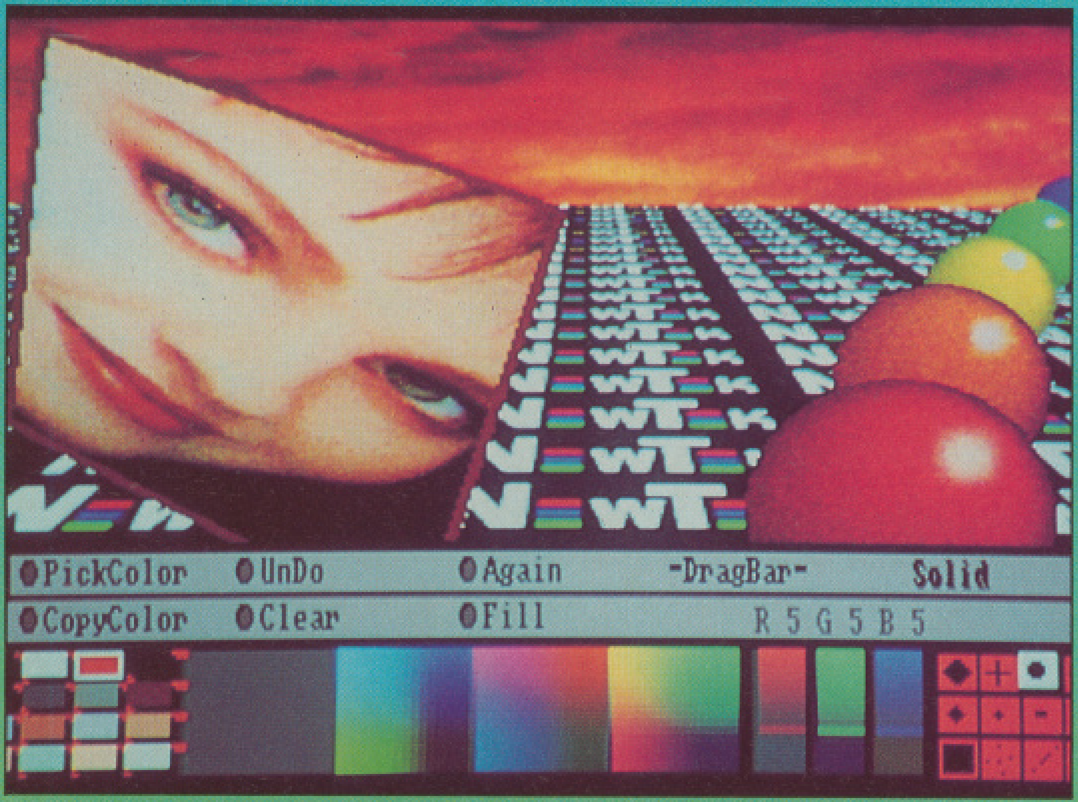
Digi Paint reads standard IFF files, so if you have drawn a picture using any art package, for example Deluxe Paint, or if you have a digitised photograph, you can quite happily load screens in and modify them using Digi Paint. Indeed, New Tek regard Digi Paint as a companion software package to their Digi View video digitiser.

The HAM mode uses six-bit planes to display images, which means that each Pixel uses six bits to determine its colour. If the first two bits are "00" then the remaining four bits are used to determine the pixel's colour, thus giving a choice of a possible sixteen colours from the total of 4096 available.

If the first two bits of a pixel are "01", then the pixel has the same colour as the pixel to the left; if the bits are "10" then the last four bits (remember they are the ones that determine the pixel's colour) replace the green value, and if the first two bits are "11", then the lost four bits replace the blue value.

The effect of all this is that you can display all 4096 colours on the screen at once, although you cannot change from black (red, green and blue all set to "0") to white (red, green and blue all set to "1") immediately. However, such a small limitation is hardly noticeable when using any HAM mode screen.

Naturally, such efficient house-keeping takes a lot of programming, and for the Amiga 500, Digi Paint



requires just about every byte of memory it has to offer, so if you still have a 256K Amiga 1000, now may be the time to think about getting that memory upgrade you have been considering.

Using Digi Paint

The Digi Paint package contains a single disk and a manual and to use it, you simply boot up the disk from the workbench prompt and you are then greeted with the Digi200 and Digi400 icons. You can examine the drawers holding Digi Paint artwork by opening them up. Once opened a miniature of each of the screens is displayed as an icon. This is very useful, especially as you can enter the package by double clicking the icon you wish to edit.

Both the 200 and the 400 resolution programmes have the same screen and menu displays, although the 400 resolution is 'non-interlaced'. Really, you need a slow refresh monitor to stop the screen flickering, however the standard 1081 monitors fare very well while using this mode.

The whole of the screen is used for your artwork, leaving a static window at the bottom, crammed full of options, including brushes of various shapes and sizes, a pair of scissors for cutting out areas for 'brushing' elsewhere on the screen, or for other files, a magnifying glass for really close up work, and a very comprehensive fill option.

Other facilities include being able to pick a colour from the picture you are drawing on. For example, flesh tones are some of the most complex colours a painter can achieve, but if you are using a digitised colour photograph, these tones are instantly accessible by simply clicking the 'pick colour' icon and moving the arrow to the desired position on the screen.

The ability to take a colour from one picture and move it to another is a very useful feature. Have you ever taken a black and white photograph and later wished it were in colour? Well, with Digi Paint you can simply take the digitised image of the photograph, transfer the colours from another photograph (or even from the colour board on the static screen) and then paint away by using the tint option. The end result can be very effective, especially with old fashioned photographs such as the presidents of America supplied with the 'Butcher' graphics utility disks.

Should you have drawn something that didn't work out as planned, you can 'undo' that portion of the drawing a little like stepping back in time to a paint before you committed something to the screen. You can also repeat options by pressing the 'again' icon, enabling you to quickly repeat operations that require complex actions.

Brushing Up The Act

Dithering is a process used by many 8 bit art packages to obtain shades of colour. For example, by having alternate pixels of red and yellow, a computer can generate an orange of sorts. With the Amiga, even subtler shades of colour can be created using dithers, so that a possible 65000 shades of colour can be obtained, comparable to the total colour capability of a Quantel graphics workstation.

The colouring of black and white pictures has become quite a heated issue in the world of cinematographers, some of whom take offence at the false colouring of old films in order to give them new life and lustre. For black and white photographs however, Digi Paint has some very real applications. For instance, once can experiment with combinations of face make up (assuming you have the right colours to begin with!) or sketch out ideas for interior decoration and clothes design.

For the sheer fun of painting, the computer can be a very expressive tool, but after being so used to the limitations of 8 colours on other art packages for other machines, the choice of colours can be somewhat overwhelming. The mouse is an excellent tool for drawing with, although I have yet to use a graph pad in conjunction with this piece of software.

Custom shapes can be manipulated for added depth and realism. A circle can be drawn with both the 'fill' option and the 'shading' option set, and this will draw a wonderfuly hazy circle with concentric circle patterns running around it. By altering the 'dither' slider to make the effects of the dithering less localised, the concentric circles change into fuzzy balls, not dissimilar to Voyager photographs of some of Saturn's moons.

Of all the menus on the screen, the Mode menu is the most useful. Digi Paint modes can be thought of as different paint types. Choosing the correct mode for a particular part of a drawing can be an art form in itself, and they are especially useful if you are merging pictures together.

More importantly perhaps, the mode effects are used to create the many subtle and varied effects possible while using Digi Paint.

The options include drawing when using solid paint, blending, tinting, light tinting, minimum and maximum pasting, as well as the usual Add, Or and XOR (exclusive or) pasting and painting styles available on other packages.



There are twelve brushes in all, these range from small circles to large diamonds and lines. There are a few basic shapes as well, including either solid or outlined circle and ellipses shapes, rectangles and squares, not to mention the spray can!

For really fine detail drawing, or particularly exacting blending work, the magnifying glass is often useful. This provides a close up image of any portion of the screen and the section you are magnifying is displayed (in real size) in the top right hand corner. You can happily perform most of the standard editing functions while in zoom mode, except for moving the magnifying glass around.

The scissors are used to cut out sections of a picture and move them wholesale to another part of the screen. Technically, this is creating a new brush, and the cut out portion can be saved to a 'brushes' file. Using the scissors with the 'blend' option set in the screen mode area can create some stunning effects, such as adding extra limbs and organs to a body. Interestingly enough, in order to create a mirror image with a brush created by using the scissors, you have to first cut out or load your 'brush' and then reverse the whole screen! Once pasted down, you can, of course, reverse the screen again, but it strikes me as being a little drastic!

Digital Drawings

Digi Paint is an amazingly intuitive art package; the mouse being very responsive and an excellent artist tool. The interesting thing about this package (other than the stunning range of colours of course) is the way that pictures can be drawn so quickly. My first attempt with the package yielded a complete artists rendition of a strand of DNA, complete with Purine to Pyrimidine cross links!

There are a great many facilities that are suitable for advanced work, such as templating and creating quarter-tones by dithering two shades of colour together. The effect is so subtle that I had to put both colours together before I (or anyone else) could notice the difference!

The 340 x 400 resolution version of Digi Paint takes up a lot of memory, on a 512K Amiga and this can result in certain functions, such as the magnifying glass and the brushes, being inhibited. However, you can reclaim these functions by moving to the 'preferences' window and clicking off the workbench. Digi Paint does not use the workbench for itself, so it doesn't need to be active while you are using the 340 x 400 package. No problems are encountered when using 1 megabyte Amigas.

Digi Paint is an excellent drawing tool, especially if you are looking for low cost professional art package with high quality outputs – the only problem is finding a printer with a good enough output!

All in all, Digi Paint is an excellent art package. It pushes the Amiga's already impressive graphics capability to its limits, and it is a friendly and powerful package with amazing potential, especially if you are interested in modifying digitised photographs (both colour and black and white), or if you are adapting pictures drawn by other, less powerful packages.

Touchline:
Name: *Digi Paint.* ***Supplier:*** *Newtek Incorporated, 115 W. Crane Street, Topeka, Kansas 66603.*



Burning Ambitions

Clarify your knowledge of Eproms and Eprom programming with this handy article.

By Mike Connors

The subject of Eproms & Eprom programming seems now to have stimulated the minds of the average computer user over here in the UK. And not before time. For some considerable time our Dutch and West German counterparts have been whipping the lids off their computers and disk drives for a quick 'chip transplant' on an almost daily basis. Well maybe not quite, but you only have to glance through any German computer magazine and see advertisements for a whole plethora of Eprom programmers, kernal expanders, replacement operating systems and the like to realise that we are missing out on something.

We are obviously much more reticent when it comes to touching the 'tricky bits' let alone removing those screws which lead to the inner sanctum. And yet this shouldn't be the case. After all the C64/128 was actually designed with ROM expansion in mind.

So what's it all about? What kind of Eprom projects can be attempted on the Commodore? These fall into three main types:

Straight forward \$8000 type eprom cartridges.
Replacing internal operating system Roms with alternative or faster operating chips.
More complex 'clever' type cartridges for fastloaders, monitors, etc.

Tools Of The Trade

So what are the basic prerequisites for this mysterious art? Access to an Eprom programmer is an obvious no. 1 on the list if you wish to program or 'burn' your own devices. If you intend to buy your own programmer these are not too expensive nowadays and you can pick up a good one for around £40. Look out for one with a monitor built into the software and make sure that it burns up to 32K devices since these are now the most economical to use.

If you are to experiment with \$8000 cartridges then a universal or configurable cartridge board will make this easy. These boards are available for under £10 and they usually have small DIP switches or links to make the Eprom on board appear in various places in computer memory. If you have an old game cartridge this could be used after removing the old chip.

For replacing the internal Roms in the computer or drive you will need a conversion or carrier board. This as the name suggests is a simple little device that plugs into the socket from where the Rom has been removed (24 pins) and this in turn accepts a conventional 28 pin Eprom. These usually come with a switch-on board to allow bank switching and again cost less than £10. If you are handy with a soldering iron you could probably knock one of these up using a couple of IC sockets and a switch.

A small supply of 8K, 16K or 32K Eproms are required. Since most Commodore projects will involve replacing one or more 8K blocks we can use the bigger of the devices and use bank switching (more later) to select the banks or pages of the chip.

Eproms come in three main guises. Standard eraseable types which can be programmed and then erased by UV light many times. Plastic one time programmable which as the name

CBM80 Autostart Routine

```
8000  09 80                        cartridge cold start vector =$8009
8002  25 80                        cartridge warm start vector = $8025
8004  C3 C2 CD  38 30              CBM80 Auto Start key letters
                                   KERNAL RESET ROUTINE
8009  8E 16 DO  STX $D016          Turn on VIC PAL check.
800C  20 A3 FD  JSR $FDA3          Initialise CIA chips.
800F  20 50 FD  JSR $FD50          RAMTAS Clear/test system RAM
8012  20 15 FD  JSR $FD15          RESTOR Initialise Ram vectors
8015  20 5B FF  JSR $FF5B          CINT Initialise VIC vectors
8018  58        CLI                Re enable IRQ interupts
                                   BASIC RESET ROUTINE
8019  20 53 E4  JSR $E453          Init BASIC RAM vectors
801C  20 BF E3  JSR $E3BF          Main BASIC RAM init routine
801F  20 22 E4  JSR $E422          Power up message
8022  A2 FB     LDX   $FB
8024  9A        TXS                Reduce stack pointer for BASIC
8025  ........  ............       START YOUR PROGRAM HERE.
```

suggests can only be burned once. These types are less expensive but are not suited to development work for obvious reasons. They tend to get used for production runs where the program is not likely to need changing. The last main type is the EEprom. This device can be erased electrically, usually with an Eprom programmer, and re-burned many times. The EEprom is the most expensive type but doesn't require a UV eraser.

Programming an Eprom

Programming an Eprom is really a very simple operation. The program designated for your chip is first loaded into memory. This could be from a number of sources: disk, tape, another Eprom or maybe from another internal Rom in the 64/128. A good Eprom programmer will allow you to make any changes to the code via its own monitor. When you are ready to program your device first check the type and program voltage. Again the ability to support a range of devices and voltages is standard with a decent programmer. With a suitable blank Eprom in the programmer, you would usually just press a key and the chip would be burned. This takes less than a minute and the contents of the chip can then be verified against the source program in Ram in just the same way as a save to disk or tape. If all is well you would then either burn another chip or quit.

Conventional $8000 Or Basic Cartridges

The 64/128 has the ability via its internal PLA to 'see' either an external Rom or internal Ram in an 8K block from $8000. In addition it will see either internal or external Rom in the BASIC area 8K block from $A000. What the PLA does is simply controlled by two lines on the cartridge port. These lines GAME and EXROM when grounded will configure the computer in either of the above ways. So if you had a M/C program that ran at $8000 or A000 then you could burn it into a chip and plug it into a simple cartridge board. By setting the DIP switch or links to ground either or both of the EXROM and GAME lines you have yourself a cartridge based program.

Auto Start Cartridges

The above cartridge would be started by calling it into action. This would involve typing SYS (start address). This would probably be OK but the Commodore has the ability to autostart a cartridge. On power up, one of the first things that the CPU does is look at the first few bytes at $8000 to see if the letters CBM80 are present. If these bytes are found then the CPU will jump to and execute your cartridge code.

A typical autostart routine is placed in front of your own code in the cartridge.

The above is a sort of 'Housekeeping' routine that does all the things that the computer would have done had it not found the CBM80 bytes. In fact the routine is taken almost directly from the Kernal and Basic system Roms. So now on power up your cartridge would 'Boot in' and, after initialising the system, jump to your program at $8025.

As you can see, if your program is designed to run in the cartridge area then it is very straight forward. However many programmes including Basic Programmes will not run directly in this way, though you can still get them on to a chip provided of course they are of a suitable size. In these cases you would use the chip as a sort of reservoir which on power up downloaded its contents to the correct place in computer Ram and then jumps to and executes the code. A relocate routine should be tagged on to the end of the autostart program at $8025.

If you think this might be a bit complicated then the add-on manufactures can come to the rescue. There are Eprom generator programmes on the market that make your M/C or Basic program and create a file ready for burning onto a chip. All the auto-start and relocate (if required) is done for you. There are also expander boards available that accept up to 8x32K ROMS that can be selected from a menu on power up. As you can imagine it would be very convenient to have your word processor, database or favourite utility available instantly. Again these devices usually have the generator program built in.

Replacing Internal ROMS

There are a number of replacement operating system Roms on the market. These include faster kernals, extended Basics and alternative DOS chips. You may however feel that you don't like a particular aspect of these devices and think you can improve them or you may just want to do something as simple as changing the screen power up message and or colours.

When modifying the kernal one of the main considerations is space since Commodore have already filled the chip with their own code. Most alternative kernals on offer concentrate on fast disk operation and so the extra space is achieved by

removing the cassette routines. This is the most obvious way to make room for your code since this represents about 2K. If more room is needed then the RS232 routines could also be cut down. A full disassembly of the kernals are listed in The Programmers Handbook. The Basic ROM could of course be given a similar treatment.

The internal ROMS are 8K 24 pin devices on the 64 so an adaptor to accept an Eprom (28 pins) is required. By burning both the existing ROM and the new system with your changes onto a new 16K chip you would then be able to bank through systems at will. Most carrier boards available have this feature indeed some offer the ability to switch through as many as four or eight banks.

Changes to drive DOS chips are for the more experienced but minor changes can be made easily. Again an adaptor board would be required. Some of the earlier parallel Dos systems such as Speedos consisted of no more than replacement Dos/Kernal chips and a cable to link the computer to the drive. This is perhaps a slightly more complicated area but it is certainly one with many possibilities.

Clever Type Cartridges

These types include external operating systems, monitors and fastloaders. They rely on an Eprom board that can 'float' in memory. This floating effect is the ability of the software on the board to switch itself in and out of the memory map. This is an obvious advantage for fastloaders and the like which need to load into all parts of computer RAM including the area under themselves and then switch out of the way.

This type of board is different because instead of EXROM line being permanently set, it is controlled by the software/board itself. This affects the PLA as described earlier and you have a 'now you see me now you don't' situation.

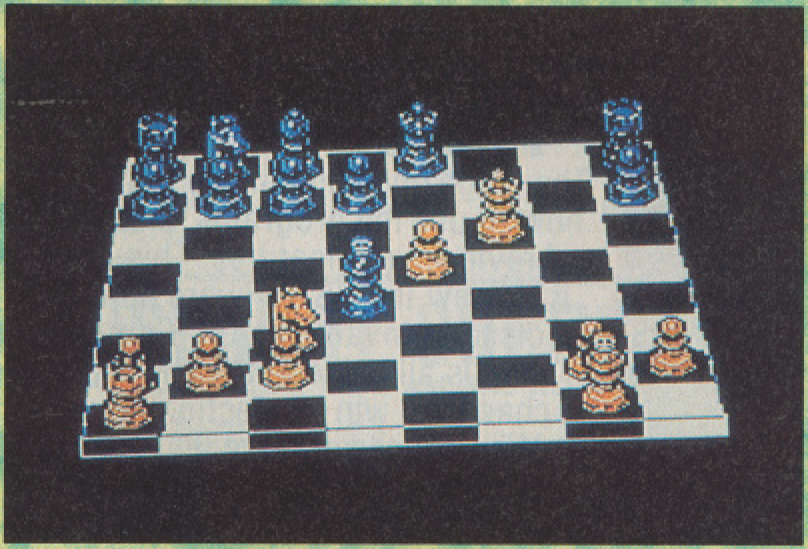
Normally this could create a problem of its own since when the cartridge is switched out, the code to switch it back in has gone. This is where two special lines I/O 1 & 2 come into action. Each of these cartridge port lines enables or decodes a page (256 bytes) at DE00 and DF00 respectively. What this means in simple terms is that you have a page (or two) available that does not go away when the cartridge is switched out. These two pages are rarely used by programmers and so are an ideal place to position the code for strobing the cartridge in and out.

If you have an old fast loader cartridge the chances are that it uses this method. These boards are generally available quite cheaply and offer some very interesting possibilities.

I have touched only briefly on each of the various areas in an attempt to illustrate the possibilities and perhaps whet your appetite. The ability to produce your own Eproms is certainly an exciting avenue and I hope this article has encouraged you to take those first steps. YC

I.Q.

For those of you who like a brain-straining challenge, then look over our intellectual selection of games.



THE CHESSMASTER 2000

All chess programmes, apart from the factual playing of the game, offer various features. Different skill levels, 3-D graphics, joystick control or whatever. To date, it has been very much a case of pick the accessories that you like the best. Now your search is over.

The Chessmaster 2000 has the most comprehensive set of features that I have yet witnessed in a single chess program. Indeed, it is difficult to think of anything that has been left out. As well as the eighteen skill levels plus an indefinite mode, there are special, easy and coffeehouse modes.

You can choose froom 2 and 3-D displays, rotate the board, change the colour of the board, alter your method of inputting moves (algebraic or joystick), set up the board to solve specific problems, take back moves, replay a game, ask for all legal moves to be displayed and even ask for a hint!

Partially played games or games that you wish to study later can be saved to disk. The package also includes a second disk containing 100 classic games ranging from the seventeenth century to the 1985 Karpov – Kasparov World Championship.

But these features are really only the icing on the cake. The play's the thing. It is difficult to assess how well a program plays without setting up a series of games against other machines or against a good player.

One of the nice things about a beginner or casual player playing against the computer is that you can set the skill level to be always that little bit better than you are.

Having played against most chest programs at some time or other, I felt that Chessmaster was stomping all over me where other programmes wouldn't have done so. There is no quoted ELO rating for the program but it does boast an opening library of 71,000 moves.

As far as any beginner or non-tournament player is concerned, I would have no hesitation in saying that this was the best chess program currently available both in terms of playing skill and features. And I strongly suspect that all but the very top players would find Chessmaster 2000 a more than useful opponent.

G.R.H.

Touchline:
Name: *The Chessmaster 2000.* ***Supplier:*** *Electronic Arts, Langley Business Centre, 11-49 Station Road, Langley, Nr slough, Berks SL3 8YN.* ***Tel:*** *(0753) 49442.* ***Machine:*** *C64 – disk only.* ***Price:*** *£14.95.*
Originality: *5/10.* ***Graphics:*** *8/10.* ***Playability:*** *10/10.* ***Value:*** *10/10.*

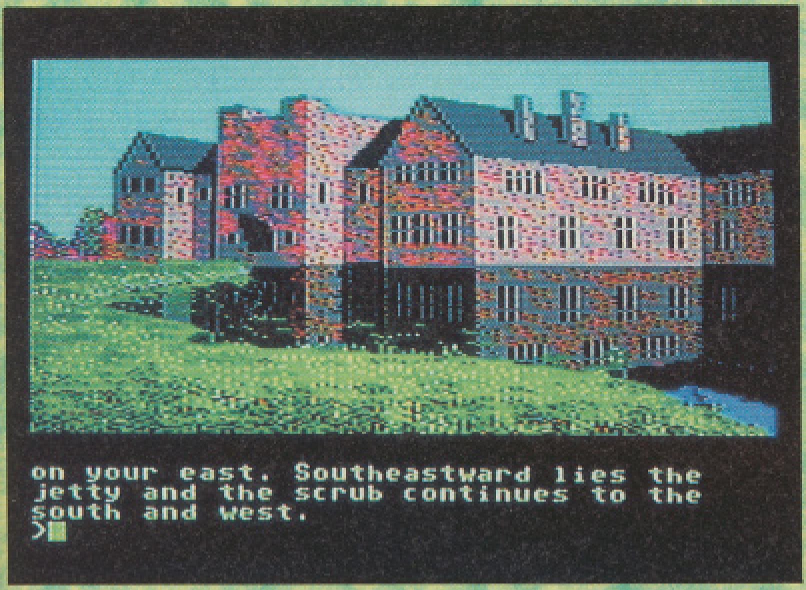
GUILD OF THIEVES

With the release of just one game, The Pawn, Magnetic Scrolls, shot straight to the top as Britain's leading adventure house. Their parser is unequalled and they brought a quality of graphics to the game that made every other graphic adventure look positively prehistoric. Even if the story line didn't quite gel at times, the game was head and shoulders better than anything else written on this side of the Atlantic. The Guild of Thieves is their second release and is

guaranteed to maintain their number one position.

You are an aspiring burglar, but all crime in Kerovnia is controlled by the Guild. If you want to keep any of your ill gotten gains, you will need to become a fully paid up member of the Guild or else risk becoming a permanent fixture at the bottom of the Kerovnian equivalent of the M25.

The Guild however does not let any old riff-raff join. You have to prove your ability first. Your initiation test comes in the form of a large mansion just waiting to be burgled. To make sure that you don't try to pull a fast one, the Guildmaster has cased the joint and knows exactly what goodies lie around the place.



The game is almost a return to the very first adventures, i.e. a treasure hunt but you are never quite sure what is going to be valuable before you store anything in the sage. Items placed there cannot be retrieved again.

The storyline, the weak element in the Pawn, is much improved and the game flows very well with some excellent and original puzzles to be solved.

I have already mentioned the parser as being state of the art but Magnetic Scrolls are never satisfied. One additional touch is that if you have previously examined a location, you can type in 'Goto xxxx' and providing there are no problems in the way, you will travel to your chosen destination via the most direct route. A boon to people who can't be bothered to draw maps.

The graphics are again excellent and have an Impressionist feel to them. You can choose to have either the full picture, a small cameo in the top right hand corner of the screen or even no pictures at all if you prefer text only games.

Superbly packaged with a copy of the latest *What Burglar* magazine, which includes a coded hint section should you get stuck, The Guild of Thieves deserves a place in any adventurer's collection. Highly recommended.

G.R.H.

Touchline:
Name: *The Guild of Thieves.* ***Supplier:*** *Rainbird, First Floor, 74 New Oxford Street, London WC1A 1PS.* ***Tel:*** *01-240 8838.* ***Machine:*** *C64 – disk only.* ***Price:*** *£19.95.*
Originality: *8/10.* ***Graphics:*** *9/10.* ***Playability:*** *9/10.* ***Value:*** *9/10.*

LEGACY OF ANCIENTS

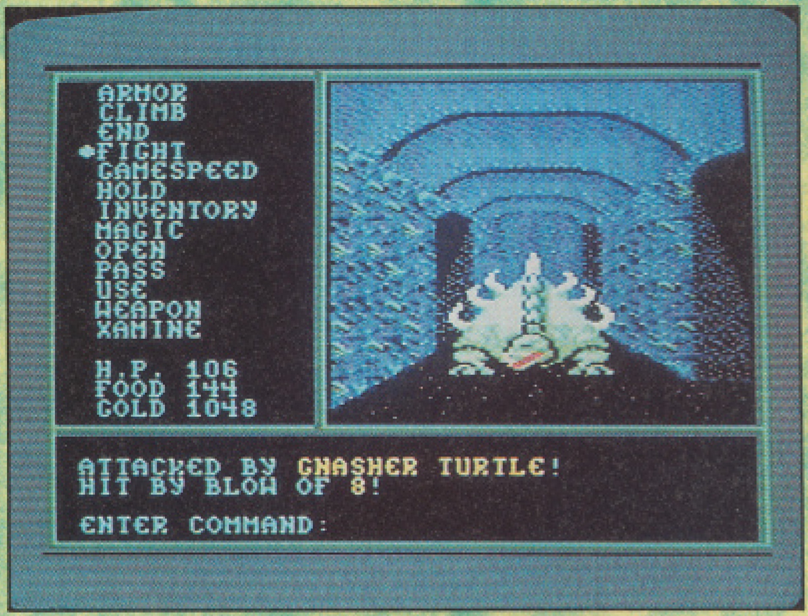
As a poor shepherd living on the planet Tarmalon, you have never strayed far from home – you have never needed to. All that is about to change, when one day you discover a body out in the hills. The dead man is wearing a gold bracelet and carrying a scroll and you feel compelled to take them, even through your first reaction is to run. Curiouser and curiouser, especially when you see a large building in front of you where none stood before.

The building is a museum and you wander round looking at the various exhibits. Most of them require a jewelled coin to access their information. You only have two jade coins at present, but that is enough to start you on your adventure.

The geography of Tarmalon is large and varied. Towns lie dotted around, but the land between them is treacherous, and monsters lurk everywhere. A few will trade with you but most are after your blood. At least, if you defeat them, you can help yourself to the contents of their lair – usually gold!

As you start, so you have little idea of what your quest entails and to make matters worse, you soon have the scroll stolen. The towns are a good source of gossip, especially if you have your fortune told. Here you can also buy weapons and armour, food and magic spells. Healers are plentiful but you need to perform a task before they will help you. Schools allow you to improve some of your attributes, for a fee of course. Money is always in short supply but there are places where you try your hand at a couple of gambling games. It is worth banking any profits too as not only do you earn interest, but your money stays put should you meet an early demise.

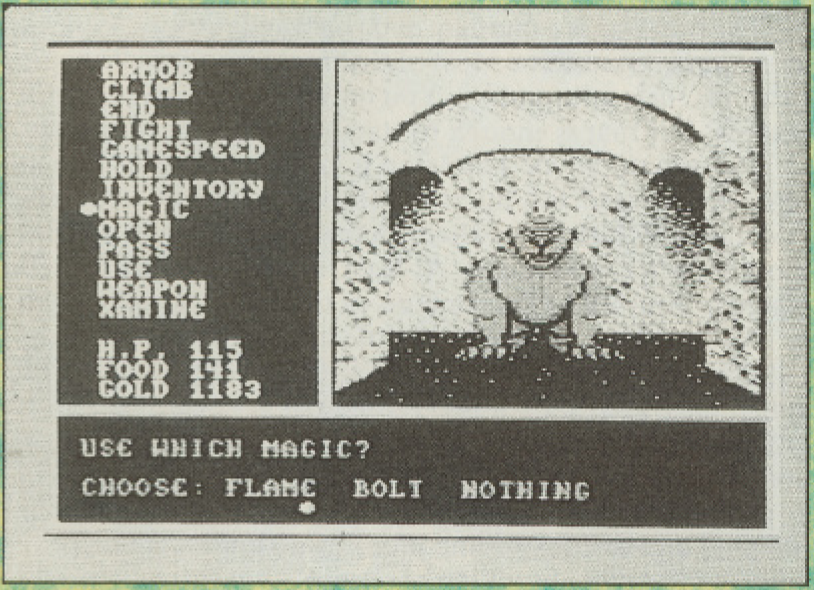
There are many smaller quests to complete before you get near your goal. Castles need to be explored and dungeons ransacked. You will need to buy boats and bigger and better weapons before eventually employing the services of a winged messenger to fly you to your final confrontation.



Apart from moving your character, the game is entirely menu-driven. The system works well and is very simple to use – no huge list of different commands to learn. The graphics come in two forms. A top down view for when you are in the wilderness, towns or a castle and a 3-D view in the dungeons and museum. The dungeons especially are accompanied by some excellent graphics for the monsters.

Legacy of Ancients, unlike some role-playing games, is very easy to get into. The plot more or less points you in the right direction as to what you should do next and there is no need for copious note taking. Despite that, it is no pushover and I would estimate some 40-50 hours of gameplay. The ending is also nicely done as your exploits are recorded for posterity as one of the museum displays. Highly recommended to both newcomers and fans of this type of game.

G.R.H.



Touchline:
Name: *Legacy of Ancients.* ***Supplier:*** *Electronic Arts, Langley Business Centre, 11.49 Station Road, Langley, Nr. Slough, Berks SL3 8YN.* ***Tel:*** *(0753) 49442.* ***Machine:*** *C64 – disk only.* ***Price:*** *£16.95.*
Originality: *7/10.* ***Graphics:*** *8/10.* ***Gameplay:*** *9/10.* ***Value:*** *8/10.*

LURKING HORROR

Horror is the name of the game in this latest adventure from Infocom. Written by Dave Lebling, author of Zork, Suspect and Spellbraker, the story oozes atmosphere.

You are trying to finish your last assignment, at GUE Tech. The terminal room is for once nearly deserted, probably due to the mountains of snow outside and the lateness of the hour. The only other occupant of the room is a somewhat rancid hacker, furiously keying into some unintelligible listing.

Logging on, you call your half completed essay but somehow the words have all changed and you find yourself being drawn into another existence as you are called upon to witness a strange occult ceremony.

Returning to the terminal room, the hacker is most impressed by your efforts, especially if you maintain his daily fix of Chinese food. He suggests that there might be some sort of mix up with the Alchemy department and suggests that you pay them a visit.

Due to the snow, getting there is not as easy as it should be. However, there is another way. Secret passages, prohibited to students, are rumoured to lie below the main buildings, linking them. It seems that you have no choice but to explore the murky depths. Shifting piles of rubbish with a fork-lift truck reveals a trap door. You open it and your nightmare is just about to begin.

This is another typical Infocom game – and that means excellent! Superbly packaged, an excellent parser (although it's beginning to show its age now) and a story that just drips with atmosphere, Lurking Horror is a game that just demands to be played after midnight with all the lights turned out.

G.R.H.

Touchline:
Name: *The Lurking Horror.* ***Supplier:*** *Infocom/Activision, 23 Pond Street, Hampstead, London NW3 2PN.* ***Tel:*** *01-431 1101.* ***Machine:*** *C64 – disk only.* ***Price:*** *£24.99.*
Originality: *8/10.* ***Graphics:*** *N/A.* ***Playability:*** *9/10.* ***Value:*** *9/10.*

THE PAY OFF

Noun/verb adventures strike again but who uses complex parsers that much anyway? The Pay Off is a welcome text-only budget offering, as a taster for those who still haven't experienced the genre and are daunted by Infocom prices.

Boy, are you in trouble! You owe the local bookmaker a cool forty thousand green bucks and all you've got in the world is £50 and a hot tip for the 4.30. How can you pay off Luigi and place your bet in time?

You can try to place a bet with Luigi but his 'boys' eject you without ceremony each time. All roads seem to lead to dead ends until you discover a drainpipe. This leads you on to discover that a fabulously expensive precious stone is due in town. The answer to your prayers is about to fall in your lap and all you have to do is work out where, when and how you can steal the stone.

Although the vocabulary in this adventure is limited to about 100 words, the game is not bounded by small-time thinking. Completing your adventure takes guile and a fair bit of shoe leather. How do you tackle a hidden safe? Short out an electric fence? Sort out a human fence? From sewer to penthouse you have to leave no stone unturned if Luigi is to be placated in time. Cross him and he'll cross you with one of those pretty white marble ones on Boot Hill.

Text-only adventures are making a come back as people realise that a lack of graphics means an excess of complexities within the logic of the game. All that has to be done now is to alert the multiples that the tide is turning and get them to stock the new games.

The Pay Off won't break the bank but it will contort your brain and furrow your brow. Buy it or you'll probably get a call from Luigi!

E.D.

Touchline:
Name: *The Pay Off.* ***Supplier:*** *Bug Byte, Argus Press Software, Victory House, Leicester Place, London WC2H 7NB.* ***Tel:*** *01-439 0666.* ***Machine:*** *C64.* ***Price:*** *£2.99.*
Originality: *7/10.* ***Playability:*** *7/10.* ***Graphics:*** *n/a.* ***Value:*** *7/10.*

Plus/4 and C16 Disk Menu

Find the program you want quickly and easily with this handy menu.

By Jeffrey Hoyle

It can be infuriating trying to find the program you require when you have a lot stored on one disk. This program displays all the program files on the disk presently in the disk drive, and places a corresponding letter or number beside the program name. On selecting a program, pressing the relative key will load and automatically run the chosen program file. If the disk menu program is set as the first program in the directory, then it may be loaded and auto-run by pressing SHIFT and RUN/STOP together. The overall result is that this program saves considerable key presses when loading and running programmes from disk.

It should be noted that the program only displays those files on disk, which have the abbreviation 'PRG' after the file name, when directoried. The other kinds of files cannot be loaded and run, like a program.

Typing In

Type in the program as listed – the REM statements may be omitted. Before running the program, it is essential that you save it, as it overwrites itself. If there are any errors, then they should be noted and corrected after the program has been reloaded from disk. After the program has been entered correctly and run, there will be a new program sitting at the start of BASIC. When listed, it should read:

10 SYS4118

The program now has to be saved, as machine code, so it is necessary to go into MONITOR. Type the following:

MONITOR
S"DISK MENU HEADER",8,1001, 12B8

From now on, the program may be saved and loaded as a BASIC program, which omits any undue complications.

Using the Program

It is best to place the program as the first file on the disk, in which it is to be used. If the disk already has files saved on it, then it is necessary to re-organise the directory, so that a free space is created at the top of the directory. The new program saved to disk, will sit in this place.

The re-organisation may be achieved, by the use of the COPY and SCRATCH commands, e.g. if the first program on disk was called 'OLD', then

COPY "OLD" TO "TEMP"

would copy the file "OLD" to a file called "TEMP", elsewhere on the disk. A check should be made, by listing the directory, before:

SCRATCH "OLD"
RENAME "TEMP" TO "OLD"

The result is that "OLD" sits further down the directory, and that a free space at the top, has been created for the disk menu program.

From BASIC, type:
DLOAD"DISK MENU HEADER"
after inserting the relative disk, and then replace the disk onto which the program is to be saved. Type in:
DSAVE "NAME"
where the NAME may be the title of the disk. It is possible to insert the Commodore control and colour codes into the program name string. In the case of the disk menu program, reverse character mode could be used, to highlight the disk name.

I have included some pokes, which enable you to customize the screen colours, etc.

POKE 4124 with the Commodore character colour code, to alter the ink colour.
POKE 4129 to alter the paper colour.
POKE 4134 to alter the border colour.
POKE 4166 to alter the vertical start position, of the menu.
POKE 4170 to alter the horizontal start position, of the menu.

For example, the default is 0 for the horizontal position of the menu. Poking with 11, centers the first column and is neater if you decide to have 16 or less programmes on the disk.



When you are satisfied with the colours of your choice, save to the disk, as instructed before.

The program also loads and runs a machine code program, if it has a SYS command, at the start of BASIC. I have found this extremely useful for auto-running games and utility programmes, and provides a more professional system. Since the program can locate a machine code program, in the correct place in memory, a BASIC program which was initially saved to disk with the high resolution graphics area set aside, will not load at the normal start of BASIC – hence the program will not run or list. To enable successful loading and auto-running of this program, it will have to be loaded into the computer using DLOAD, and then saved once again. YC

See Listings on page 123

Commodore 128 Preferences

Predefine your defaults with this time-saving C128 utility.

by D. Anderson

One of the more useful features provided by some of the WIMP operating systems now being employed on new computers, is the ability to define the default characteristics of your computer, rather than have them dictated to you by the manufacturer. This means that when you turn on your computer, it retrieves a special file from the disk drive which contains all the information necessary to set up the system (e.g. screen colours, cursor type, key repeats etc.). You could do this manually every time, but it is time consuming and will in any event be reset as soon as you press RUN/STOP and RESTORE.

Luckily, the Commodore 128 automatically boots the disk drive at switch on, so it has the ability to load and execute a preferences file, but for this to be really useful it is necessary to be able to direct the computer to reset the characteristics of the computer to those in the preferences file every time RUN/STOP and RESTORE are pressed. This means that if a particular program changes, for example the screen colours, you can reset them to your preferred choice simply by hitting RUN/STOP and RESTORE - which is what this program enables you to do.

Furthermore, whilst dabbling around with the machine, I have managed to correct two minor, but very irritating bugs, the routine for which is included in the preferences file, so that they should never rear their ugly head again!

The first is the split screen glitch – if you type GRAPHICS 2,1<RETURN> you will see at the junction of the graphics screen and the text screen an unsightly flickering which is intensely annoying, and really can spoil what would otherwise be very professional looking programs. The split screen is handled by the editor interrupt routine which has a vector at location $314. So, by redirecting this vector to the new interrupt routine, I have been able to correct the bug.

Essentially, the problem of split screen glitches occurs because of an oversight by programmers. Now to explain this, I am afraid that I shall have to get a little technical, but bear with me, as I have tried to simplify it as far as possible. Firstly, you must know that a television picture (such as generated by your computer), is generated by firing electrons in a beam at the screen, which causes it to glow - this beam of electrons moves from left to right, generating each line on the screen (raster lines). In order to program a split screen, the pixel line at which the split is to occur is defined, and the computer causes an interrupt to occur when the beam on the television reaches this line.

Once this has occurred, the IRQ routine is entered and the computer has to determine what has caused the interrupt, since there are several possible causes. Then, when it is sure the interrupt was for the split screen, it can then change the screen mode for the rest of the screen. However, all the time the computer is deciding what caused the interrupt, the television is still drawing the picture, so by the time the screen mode has changed, the electron beam which draws the television picture, is halfway along the line. Furthermore, the computer does not always change the screen mode at the same time, since its timing can not be 100% precise, and so the position at which the split actually occurs oscillates about - hence a glitch is produced.

Delaying Tactics

Now, good programmers take note of this, and build a delay into their program once the split routine has been entered, so that they can be sure that the change will occur within the border, and so any glitch will not be seen. You might well ask why Commodore did not do this, after all they ought to understand their own machines, should they not? Well, after inspecting the split routine, it seems that they have tried to do it.

But what I suspect has gone wrong, is that the UK operating system is the same as the US one, but the US runs at 60 Hz, and the UK at 50 Hz. This means that there is a difference in

timing on the computer between the two countries, which has not been taken into consideration, and hence the delay is not of the correct length to ensure the glitch is pushed into the border. Cure-change the length of the delay, and the problem is solved.

The second bug is that in some of the early Commodore 128s that were shipped, the Caps-Lock Key did not work with the letter Q. As a result, when this key was depressed, you had to use the SHIFT key to get a capital Q, which was rather inconvenient, especially if you forgot.

The reason for this niggling fault is just one faulty byte in the Kernal ROM. Within the Kernal, there are several tables which define the ASCII code which is to be returned for each key-press – one for normal. Shift, C=, Caps-Lock and the Alt key. Also within the zero-page, are vectors which point to the start of each of these tables. So all that is necessary to fix this bug is to produce a corrected version of the faulty table and redirect the vector towards the new version. This vector, at $348/$349, is redirected to the start of the new table.

As I said, there are tables for all the different 'modes' of the keyboard, and they all have vectors. So if you wish, it is quite feasible to redefine the keyboard using the procedure outlined above - just by redirecting the vectors, and replacing the ROM tables. Also, as a result of tinkering with this routine I have noticed that the ALT key can be used to acquire lower case letters whilst the Caps-Lock key is depressed – something not noted by Commodore.

Keeping your Options Open

The program as listed, corrects both of the above mentioned bugs, and also allows you to set the default options, which include:

40 column background colour
40 column border colour
40 column foreground colour
40 column cursor flashing, or solid
keys to repeat or not
Type of 80 column cursor (fast, or slow flashing, solid, underlined)
80 column background colour
80 column foreground colour
Default to upper or lower case
Enable or disable SHIFT/CBM character set change.

The machine code contains checksums, so if you make a mistake typing in the code, you will be informed of it once the program is executed. The routine resides at $1300, which is destined to become to the C128 what $C000 is to the C64 - a special 'safe' section of memory in which routines can be located without fear of being interfered by BASIC. Once the options have been set, the preference file is saved onto the disk, and you are given the option of setting up the boot sector to load the routine when the machine is switched on. If you wish to do so, you will probably need a blank disk. This is because on a used disk, the special section of the disk used for booting, is quite likely to contain a file. In any case, if you do use a used disk and the boot sector is occupied, the program will report this, and not allow you to set it up.

For the cassette users, lines 1110 to 1380 can be omitted. The program can then be loaded and executed at the beginning of every programming session.

See Listings on page 123

The Video Title Shop

A look at one of the latest graphics packages.

By Tony Hetherington





The Video Title Shop is described as a computer and VCR utility which can generate animated introductions to your video tapes. This is obviously useful to those lucky few who own a video camera, but also applies to anybody who records and keeps anything, as well as being a way to produce animated shop window displays.

The Video Title Shop is supplied on disk and is accompanied by a 48 page manual that takes you through the steps of planning your sequence following the programmes Command bar prompts, using micropainter plus to draw your backgrounds, adding text in a variety of font sizes and colours and how to link it all together into a sequence complete with scrolling and fizzle effects. And of course the all important instructions explaining how to connect your computer to your video are also included.

Micro painter plus is a straight forward graphics package to use complete with solid andeditable pattern files, so interesting backdrops can quickly be created for your sequences which are then saved to disk. The Video Title Shop can then use these backdrops or canvases and a base for a sequence.

A typical Video Title Shop sequence consists of four or five pages, a couple of backgrounds and one or two special effects. Each page is actually quite a lot bigger than your computer screen so it's easy to create some text that can be scrolled on to the screen. This text can appear in a variety of font sizes and colours and is typed into an object. If you want to mix text colours and sizes then you need a new object for each style of text, if not then your entire page of text can be a single object.

Once an object is created it can be moved around the page to get the positioning exactly right.

A single page may be enough to announce that the video tape contains the pictures taken at Fred's third birthday, but for other occasions and advertising demos you'll want a series of pages and you'll want to link them together in an interesting way. The Video Title Shop makes this easy.

The number of pages you can have is only limited by the C64's memory but since the final sequence is to be recorded on video tape you can record the whole sequence in two or three sections (naturally the package will work with both VHS and Betamax videos).

As I mentioned earlier you can scroll text across the screen and you can also set up a timed page that will stay on the screen for any set time between 1/3 second and 15 minutes when the sequence continues. My favourite effect is undoubtably the fizzle in which a new page fizzles over the old one, pixel by pixel until the image is complete.

The Video Title Shop is actually little more than a graphics package with built-in animator (and a few added effects) but it could be just what you've been waiting for.

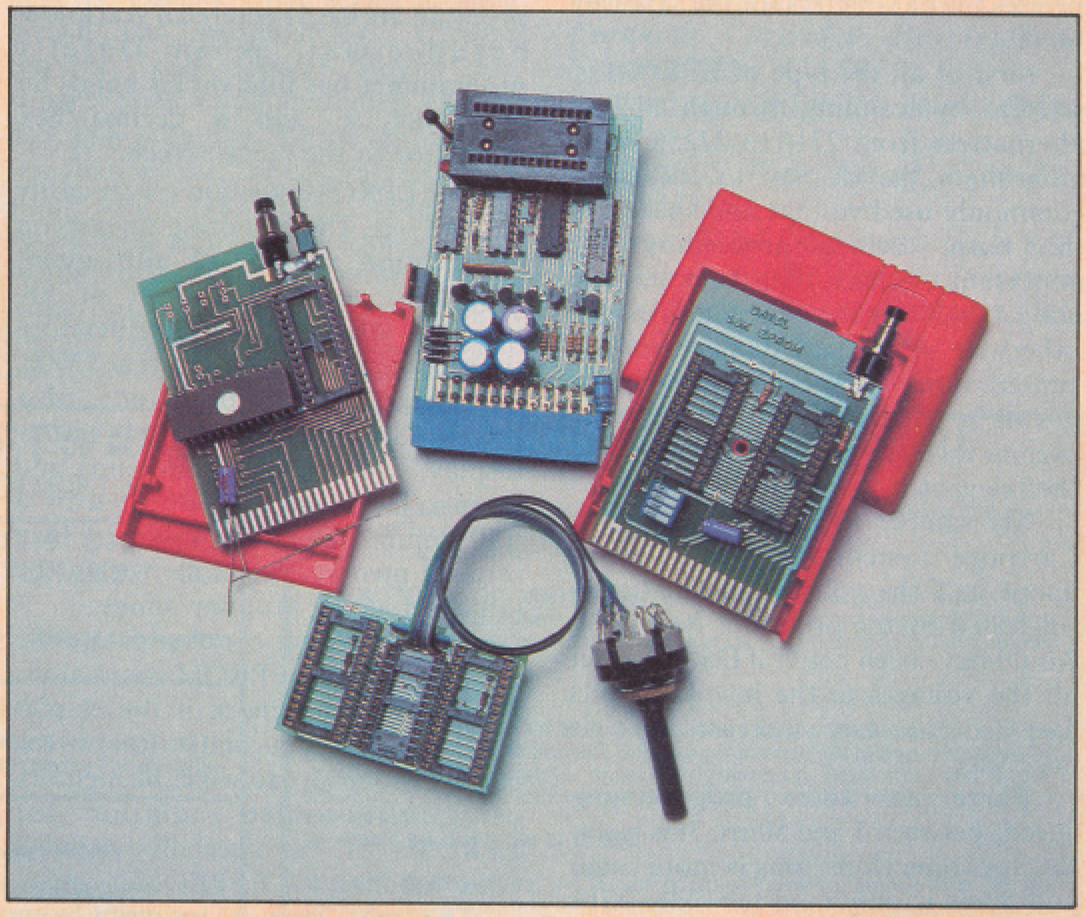
YC

Touchline:
Title: *Video Title shop.* ***Supplier:*** *U.S. Gold, Units 2-3, Holford Way, Holford, Birmingham B6 7AX.* ***Machine:*** *C64.*

ROM Blow

Feel the burn as Datel's professional DIY cartridge system.

By Eric Doyle



Datel has recently leapfrogged over other utility manufacturers, putting itself in close competition with Evesham Micros. As their product range increases, Datel is refreshing parts of the Commodore system which users could never reach: the cartridge port.

The Datel Eprogrammer's armoury is growing daily but the main elements of their cartridge system are the Eprommer 64, the Cartridge Development System, the 16K EPROM board and Five Way Kernal Expander.

Before assembling a cartridge you need a programmed chip to put into it. EPROMs are identical to the ROMs already inside the C64 in all but one respect, an EPROM can be erased and reprogrammed. Datel's Eprommer 64 is tailored to the C64 and provides all you need to transfer your program from memory to chip.

EPROMs have a code number which reveals their memory size. Most codes start with 27 and the next two or three characters reveal their memory size multiplied by eight. For example, a 2K EPROM would have a value of 8*2 or 16, therefore its code would be 2716. this coding leads to a lot of misleading advertising where 2716 types are referred to as 16K (presumably 16 kilo*bits*), through to 256K chips which are really only 32K.

Eprommer 64 is supplied with its own software which controls the hardware through the user ports. The largest chip which the system can handle is the 27256 (32K) which is equivalent to half of the C64s memory.

Before you start getting too excited about this, let me explain that the maximum space a cartridge system can access easily is a block of 16K. Furthermore, because the C64 cartridge system is designed to access 8K chips, a 16K chip can only be accessed as two 8K blocks this means that two 8K programmes can be stored in one cartridge. There is also a dual 16K cartridge but I'll come to that later.

Before you can use the Eprommer effectively you have to penetrate the mysteries of one of the worst documented orifices in computer history. Commodore treat their cartridge system like a trade secret and for most owners it is inner space's answer to a Black Hole, we know things go in but the where, how and why of what happens next form part of the greatest enigma known to man.

Fortunately Datel have unravelled the mystery and their 20 page manual lays bare the inner secrets of the cartridge operating system.

What it boils down to is that the system can be tricked into thinking that your cartridge is a normal part of C64 memory occupying locations $8000-$9FFF. When the computer powers up, among other things, it does a test to find if the code CBM80 is stored at location $8004. This is the autostart key and causes the normal reset routine to abort in favour of the cartridge and a jump is made to a vector pointed to by $8000-01.

The user program can only run in cartridge space unless a routine is included which will transfer and execute it in normal RAM space.

Obviously, this means a certain number of modification will have to be made to your program before loading up your EPROM. Datel's Eprommer software allows for this by including a monitor as well as the fully comprehensive chip burner.

Blow Keys

Once prepared, the programming of the chip is child's play. The computer displays a menu and using single key presses the parameters for the save can be set.

First of all the type of EPROM is selected by scanning through all five alternatives from 2716 to 27256. This also alters the display to the most commonly used voltage and speed for the burn. Before proceeding it's important to check that the voltage is not too high for the chip you're using, otherwise permanent damage *will* be caused. If the voltage or speed is wrong it can be changed independently by cycling through the alternatives using the relevant key.

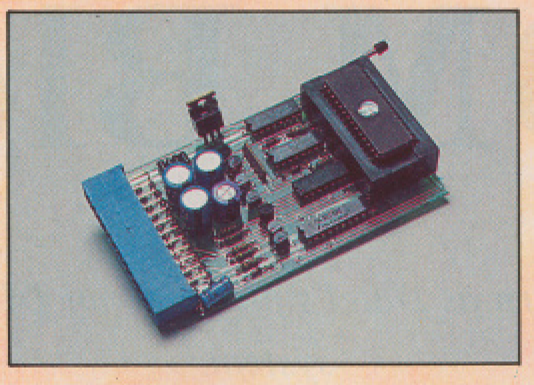
My sample EPROM, part of the Cartridge System kit, was rated at about half the voltage automatically suggested by the program. Perhaps it would have been better if Datel had set all the voltages to the low 12.5 volts and let the user increase this as necessary.

There are three programming speeds between 3 and 50ms, 3ms is too fast for some chips, 4ms is more usual and 50ms is only used for older 2716 and 2732 EPROMS.

Normally the program for transfer will be stored in RAM but occasionally you may want to back up a kernal chip. Selecting ROM using the asterisk key switches in the ROM chip ready for reading.

Today's chips can have such large memories that you may want to program it in 8K blocks. An ALL or RANGE toggle is provided for this purpose. When set to ALL the whole chip will be programmed but on RANGE it depends on which range has been set.

To set a range requires the minimum of thought. All you need to know is where your program starts in memory, its length and where it will



start on the EPROM. Remember that the location of the program in memory at burn time need not bear any relationship to its eventual location in memory at run time, all this is preset under cartridge program control later.

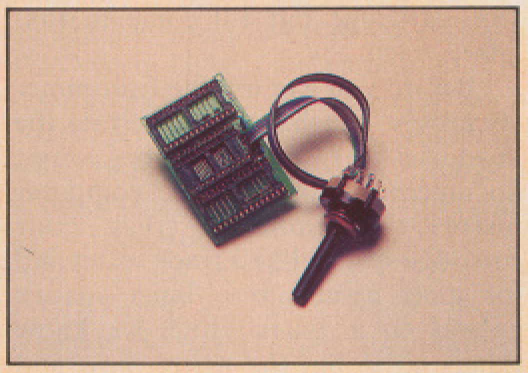
The start and length of the program are easily entered if you know hexadecimal. When Datel's programmer has time on his hands he may like to add a decimal/hex calculator to the menu screen.

The EPROM position is very easily worked out. The first program goes on at location $000 and subsequent programs normally go on at 8K intervals. 1K is $400 bytes therefore the second program will start at $2000.

Several DOS commands also appear on the screen: directory display, disk commands, loading and saving. These are supplemented by a 'fill' command which pokes a zero byte into all memory locations within the limits set as the program range.

The remaining commands are the vitally important EPROM commands. Firstly, you can check if the chip is blank. If not you must follow the correct procedure to wipe the memory using ultra-violet radiation for EPROMs or the specially included erase function for EEPROMs.

The next step is to write your program to the chip (burning) and then verify it against the RAM source. For those doubting Thomas's who want further convincing, you can also read the EPROM into memory again. This comes in useful when you want to back up a commercial EPROM, suck



the program into memory, and blow it out onto your disk.

A la Cart

Now you have your Eprom you can tackle cartridge production. The Cartridge Development System has a ready to blow 16K EPROM and all the boards and components (all four of them) necessary to set up your board. A reset switch is already fitted next to a switch to allow the selection of which half of the 16K EPROM you are using. The supplied cartridge casing has two cutouts through which the switches will protrude.

Also included in the package is a full 20 page explanation of cartridge theory and assembly. With a minimum of soldering ability, most people will be able to produce professional-looking cartridges.

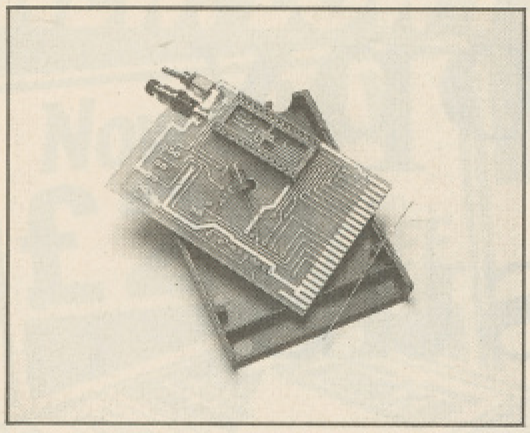
The other cartridge containing the 16K EPROM Board can hold two 27128s which may be switched into memory at $8000 and $A000 giving 16K of contiguous RAM (8K from each chip). As with the single chip version the other halves of the two chips can be used to store another 16K program.

The only problems I found with the system were difficulties related to cartridge assembly. Firstly, an experienced programmer may not be very knowledgeable about electronics. To fit a cartridge doesn't require any electrical know-how but it would help if the instructions pointed out the ways to tell which way round a chip should be fitted into the cartridge.

After fitting the chip your problems are not over, the currently fitted DIL sockets which hold the EPROM are too thick. Fitting the two halves of the cartridge together leaves a gap around the edge which, although small, detracts from the professional look of the product.

A final point, concerning the 16K Board only, is that the bank switches on the dual chip cartridge are internal. Everytime the user wants to switch from one program to the other, the cartridge has to be unscrewed, opened, switched and then closed.

With the inclusion of two excellent battery backed-up RAM cartridges (Smart Cart) in Datel's catalogue, the question must be asked: Why bother with burning when Smart Carts are so cheap?

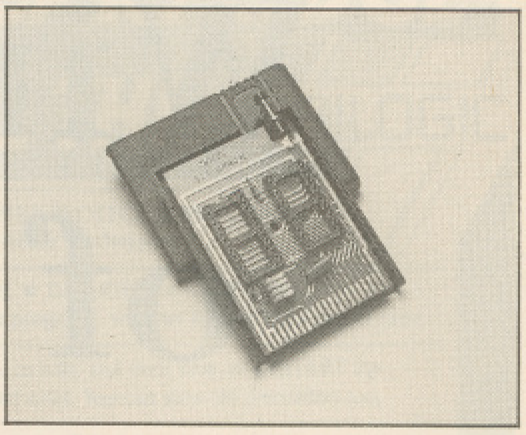


The cost of a Smart Cart is £14.99 for an 8K pack. For a Cartridge Development System the cost is £12.99 but you have the added expense of £39.99 for the Eprommer 64 unit. The difference being that the System cartridge has two 8K programs and you are free of the worries of battery replacement or failure. If you only envisage using two or three cartridges the Smart Cart is good enough. If you can foresee a need for dozens of cartridges and extra Kernal chips then an EPROM system is. your only option.

ROM Banking

Datel also has other interesting products which link in with the Eprommer 64. Take the Five Way Kernal Expander for example. Carefully replace your Kernal ROM with a socket and you can plug this board in and refit your ROM. Flanking it on either side is a pair of 16K EPROM sockets which allow you to add four more 8K operating systems. Using the supplied switch to select the chip you want, you can power up into an operating system of your own making.

Each month when I see their adverts, Datel's range seems to have grown. The Eprommer 64, Cartridge System, and Kernal Board are superbly conceived, extremely easy to use and, with 16K EPROMS costing less than a fiver, the cost of producing your own cartridge compares favourably with that of commercially produced ones. With motherboards, Superom boards and cartridges already on Datel's books ask yourself



how much longer you think you can ignore EPROM programming.

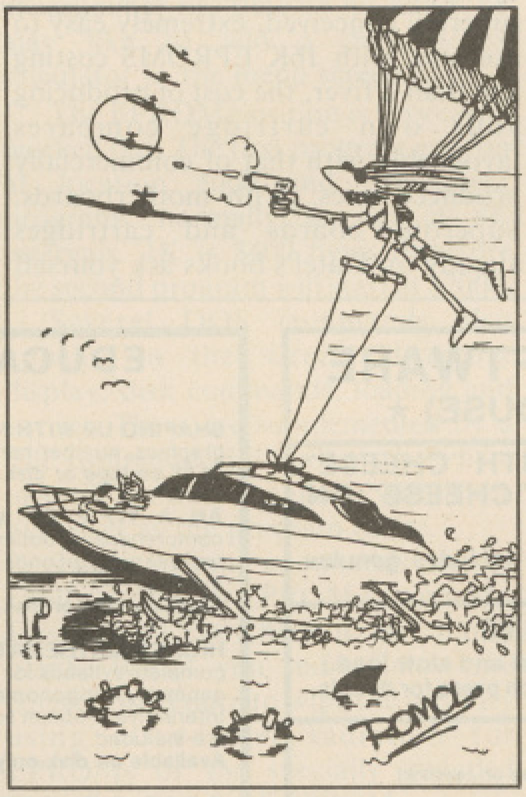
Touchline:
Product: *Eprommer 64.* ***Price:*** *£39.99*
Product: *Cartridge Development System.* ***Price:*** *£12.99*
Product: *16K EPROM Board.* ***Price:*** *£8.99*
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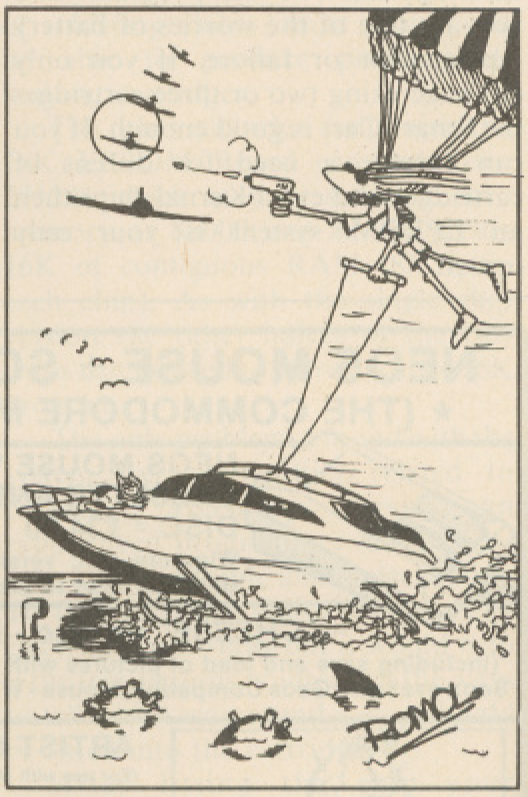
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How to Enter

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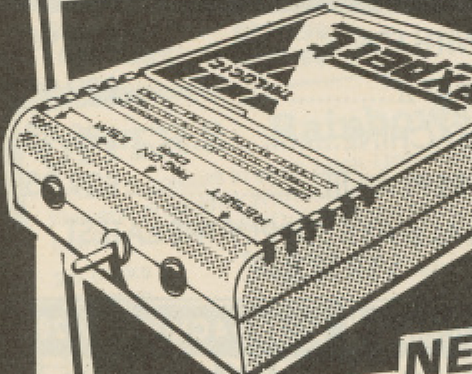
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Bulletin Boards

Continuing our computer communications series, this month we look at the various uses of bulletin boards.

By Jennifer Goldsmith

Generally speaking, a bulletin board is an electronic noticeboard, which permits two-way communication. This means that the user can obtain information *and* contribute to the system. It differs from a conferencing system in as much as there are no closed user groups (CUGs) and there are no individual conferences, which are separate entities, with different people organising each conference.

Conferencing systems are usually run by commercial organisations and the subject matter is very diverse. Whereas bulletin boards are usually, but not always, run by the hobbyist and the subject matter is usually specialised in as much as the topics are related to a specific hobby or interest, e.g. PCs, Commodore Computers, Amateur Radio, etc.

How do Bulletin Boards Work

Basically, there are two different ways in which they work. Either you phone them and when the modem answers, you connect your modem in the appropriate manner for your software, and then you log on. Or, after you phone the bulletin board, you hang up and the bulletin board's modem phones you back. This latter type of logging on is not so common as it is more expensive to implement but it does give greater security. If you go to log on to a bulletin board after having used a commercial system like Prestel, you may find the bulletin board unfriendly.

Exactly what is required differs from system to system but you will find that often your name is required followed by a carriage return or hash. Never, ever, divulge your Prestel ID or password, or any password on any other system (unless everything is free and you have nothing to loose by doing so!).

Some bulletin boards, especially those whose software originated in the USA, operate at 300/300 baud scrolling. However, with the growth in popularity in the UK of viewdata systems, some software has been written for bulletin boards using this format, i.e. colour and 1200/75 baud. Therefore as mentioned in the October issue, you have to make sure that you have the appropriate software and that the modem and software are compatible.

Growing in Popularity

One of the reasons why bulletin boards have become popular, is that anyone can set them up. For example, a C64 with disk drive, autoanswer modem and bulletin board software for the 64 costing £69, which is available from Y2 Computing, is all you need.

However, many of the popular boards have a hard disk attached. This allows an increase in speed of operation and allows much more material to be available to the user. For example, with a 1541, only a couple of hundred or so frames (in the case of viewdata compatible boards)

could be stored, but with a hard disk, thousands of frames could be stored and/or much telesoftware as well. Therefore, bulletin boards are not only expensive to set up but they are also hard work.

For this reason, you will find that access to some bulletin boards is restricted to certain hours only, yet others are available 24 hours. No-one can give you hard and fast rules when it comes to bulletin boards as there are about 200 in the UK, thousands in the USA, and the number is on the increase.

You may have difficulty in accessing popular boards, as many people are trying simultaneously and there is usually only one phone line, which means of course that only one person can use the system at any given time. You must bear this in mind when you're using a bulletin board, so that you minimise the time you are on-line in order to let others on the system.

Listings of Bulletin Boards

It would be very difficult and impractical for me to provide a complete listing of bulletin boards in the UK. There are various sources for lists, firstly the Bulletin Boards Operators Association, which is an association to which systems operators (sysops) can belong. This information is also supplied to ClubSpot on Prestel. However, these sources of lists are not currently available as unfortunately they were destroyed in a fire, and are in the process of being re-compiled at the moment.

The other source of lists is the magazine Telelink, which comes out six times a year. It is a magazine wholly devoted to communications in the UK and at £15 for two years subscription, it is a MUST. Just contact Database Publications on Prestel MBx 614568383 or on Telecom Gold 72:MAG001 and credit cards are an acceptable means of payment.

Finding Your Way About

There is no easy way of knowing what bulletin boards have what information. Either you get information from your friends and colleagues or you just phone around. Anyway to get you going, here is a brief description of some of them. However, I can take no responsibility for any errors or omissions.

The first one I would like to mention is a fairly new board, based in Wolverhampton, telephone number 0902 745337. (It may be on PSS but I am not sure.) What is unique, is that (to my knowledge) it is entirely devoted to Commodore users, covering all machines including the Amiga. There is an increasing amount of telesoftware. It is available 24 hours on both 300/300 and 1200/75 scrolling.

The next bulletin board is devoted purely to a hobby. In this case it is Amateur Radio. The Radio Society of Great Britain run a bulletin board (tel: 0707 52242) which is available 24 hours on 1200/75 baud viewdata format. Normally only one phone line is available but I believe it is hoped that two lines will be in use before long.

This bulletin board has a fairly large database on various aspects of amateur radio, including band plans, a diary of events, rallies and contests, information on morse tests and the radio amateurs examination (rae), news from both home and abroad, packet radio, solar propagation, club information and news, RAYNET, repeaters and beacons, books and other products which can be purchased from RSGB, RSGB services, satellites and information for beginners.

In addition to this, there are response frames for ordering books, etc, by credit cards, for obtaining information and you can write your own messages as well. Unlike most boards, it is updated most working days as a full-time editor/database manager is employed.

The Gnome at Home is a very popular board which supports six phone lines 24 hours a day. Two of these phone lines are for the general public, the other four are kept for the paying subscribers. Subscription is very cheap and only costs £1.50 a month which is well worth while, just to be able to access the board more readily. The two lines for the public are on 01-888 8894 at 1200/75 baud, using viewdata compatible software.

The London Underground bulletin Board is available 24 hours on 01-863 0198 on 300/300, 1200/75 and 1200 full duplex and has about 4000 callers a year. This is quite good, but I believe RSGB has between 14-37 callers a day. However, this bulletin board runs on a PC whereas RSGB's database uses a BBC. Both make use of a hard disk as does the Commodore one which also uses a PC clone.

There are two BABBS boards. BABBS stands for British Apple Bulletin Board System. They run at 300 baud, are sponsored by BASUG, British Apple Systems User Group and are available 24 hours a day on 0394 276306 and 0268 778956.

Robert O'Donnell's bulletin board in Manchester was the first bulletin board to use a BBC micro and colour. Robert has worked for a few computer companies and has even written his own communication software. His board covers most interests, something for everyone – adventure, BBC software, jokes and advertisements. No wonder Micronet are currently employing him!! Rob's board is available 24 hours at 300 baud on 061-427 1596.

Lynn Hurd, who is the sysop for the Communitree Hope bulletin board in Powys, Wales was most probably the first female sysop in the UK. There are currently only about three of four female sysops on the UK (in over 200 boards!).

One important point is that in order to access the board you do NOT have to be using the same computer as the one which is running the board. For example, a BBC may be running the RSGB board but any computer which has viewdata compatible software using 1200/75 will be able to access it.

Accessing Boards in America

The bulletin board industry in America is, unlike its British counterpart, very organised. Most States operate on what is known as Bell frequencies. The UK (CCIT) tones do not work in the USA (and Canada). Therefore your modem will have to be able to cope with the Bell frequencies. The bell frequencies, in Hertz, are: Bell 103 (300 baud) is Originate: transmit 1070 (0) 1270 (1) ; receive 2025 (0) 2225 (1). Bell 202 (1200 baud) transmit and receive 2200(0) 1200(1).

This is half-duplex and is the same as our 1200 half-duplex. However the 300 baud is not the same as the British 300 baud.

Once you have overcome the problem of the Bell tones, your next problem will be the logging on. As

when you log on, most systems will ask you your telephone number. In America these are always quoted in the format XXX: XXX: XXXX. This is fine if your phone number is 061:123:4567 but if you live in London instead of quoting your phone number as 01:123:4567 you will need to add an additional zero before the 01.

Once you have logged on, do not get upset if the system seems a little slow, just remember that it is most probably supporting more than one phone line (otherwise you would not have got one!) and also that all sysops are volunteers and under no obligation to provide a service.

In the USA, there are something like 4,000 or so bulletin boards, so again a complete listing is impossible, but here are a few for you to be getting on with.

Chicago (CP/M Users) 0101-404636-6130 on Bell 300.
California (Dial Your match) 0101-209-298-1328 Bell 300.
Los Angeles (Consumer news) 0101-213-653-6398 Bell 300/1200.

Compunet

Compunet is the first commercial network service in the UK to operate along bulletin board lines. The service now has several thousands of Commodore 64 users and improved software and thirty ports to cope with them. Unlike most bulletin boards, you can actually buy goods and have them charged to your account, which is normally paid by direct debit.

There is a wide variety of telesoftware to include everything from printer and communications utilities to 128 software and even items for the Amiga. ICPUG, the Independent Commodore Products Users Group has a large database with something for everyone, from hints and tips on using suberbase, to news and software.

Other clubs include ICC, the Independent Compunet Club, Club 128 for 128 users and special interest sections including ChessNet for chess enthusiasts and amateur radio and photography areas, to name but a few.

Compunet works at 1200/75 baud and you have to use its unique software which will only work with the CBM modem. The first time you log on to Compunet, after registering and obtaining your password, you will see the message LINKING. When you quit the system, you must save the software, to avoid having to LINK again, by doing a CNSAVE. When you next go to log on to the system, you will type in the command, CNLOAD, the software will load from your disk, you then type CONNECT, hit RETURN and the software, which will have stored the phone number, will autodial for you. You will be able to see when you are connecting to Compunet as the colour of the screen changes from blue to violet.

Compunet like many bulletin boards has an area in which you can load your own material. On Compunet this area is called the Jungle. Yes, you can even sell your own programmes on Compunet providing you are willing to let Compunet take some of the money as commission! Happy Hunting! YC

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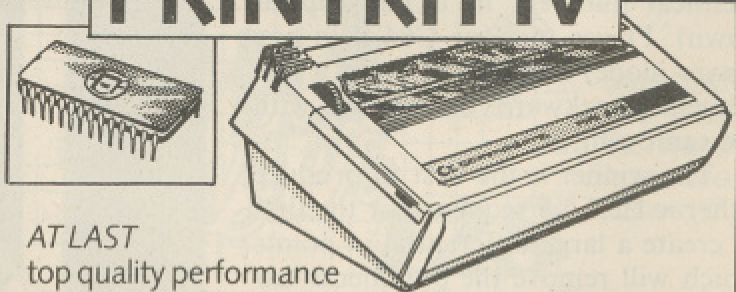
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Number Tumble

A frustrating game for two players.

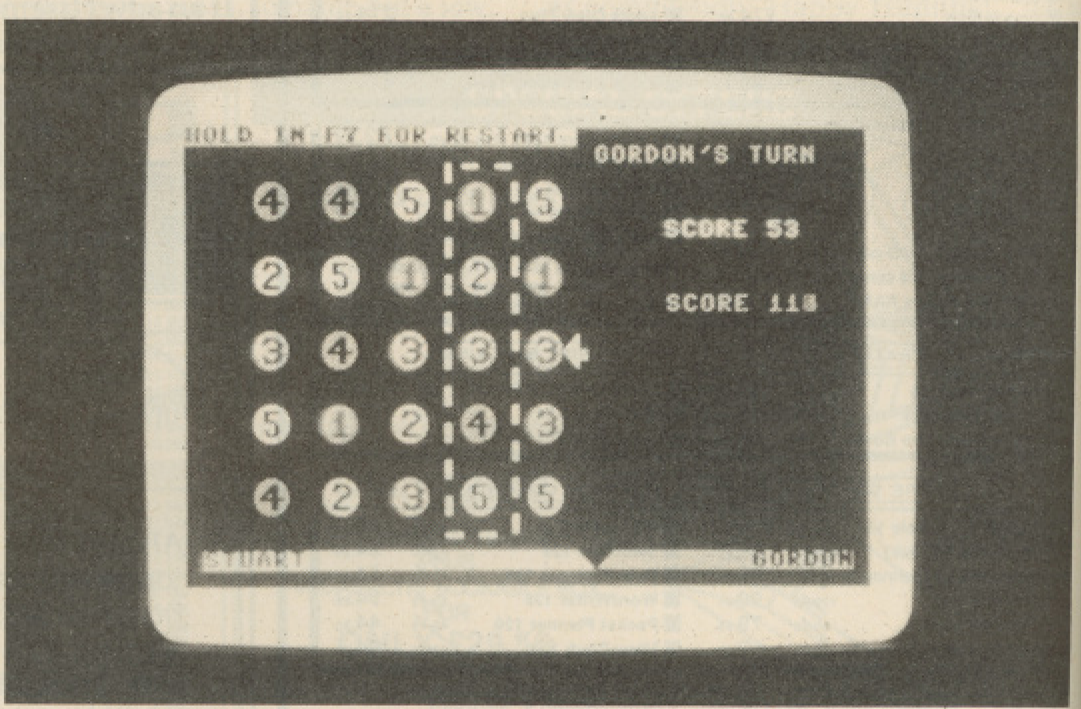
By John Phillips

The basic idea of the game is that a 5x5 grid of numbers between one and five is presented. Player one can move a column one place up or down (with a wraparound effect) to produce either a winning sequence of 1,2,3,4,5 reading up, down, left or right; or to produce scoring sequences of 2,3,4 or 5 identical numbers in a line (up or down). Player two (or C64 if in one player mode) then has to move a row one place backwards or forwards with the same aim.

The winner is the first to produce either a 1,2,3,4,5 sequence or the first to create a large differential in points which will remove the opponents bar marker from the bottom of the screen. Both methods result in a 100 points bonus.

To add to the fun, after all 3, 4 and 5 number scoring sequences, at least two of the numbers are changed by one count in either direction. There are not random changes but they are explained more fully in the program.

In 1 player mode, a pre-selected level of 1 to 5 gives the computer 20% to 100% chance of achieving the highest obtainable score for its turn, but will *always* detect a 1,2,3,4,5 sequence if one is available. The higher the level, the longer the time the computer needs to respond, but this is indicated on screen via a countdown timer.



Other than the random selection of the initial grid the game is totally logical and requires careful thought. Games may last a couple of minutes to half an hour or more, depending on intellect between players or the level selected.

Getting it in

The program is presented in two parts; the first contains all the data for m/c sequences and U.D.Gs and also for copying character sets. The DATA LOADER must be typed and saved before the Number Tumble program.

A small normalising program has also been given because if RUN/STOP and RESTORE buttons are used after running the main program the screen blanks and no typing can be seen. This is due to the banks, screens and characters having been shifted around.

Type RUN 10000 (even though you can't see it) and the computer will return to normal after RETURN has been pressed. This add-on program proved useful during development of the game and may similarly help while de-bugging takes place.

See Listings on page 117

Software for Sale

If you think that one of our programmes looks very interesting, but you can't afford the time to type it in then our software service will help you out.

It's three o'clock in the morning. You sit at the computer keyboard just finished a marathon typing session entering one of the superb programmes from *Your Commodore* Your fingers reach for the keyboard and press the letters R, U and N. You press RETURN, sit back and nothing happens.

Everyone has probably faced this problem. When it does happen it's a matter of spending hours searching through the program for any typing mistakes. No matter how long you look or how many people help you, you can usually guarantee that at least one little bug slips through unnoticed.

The *Your Commodore* Software Service makes available all of the programmes from each issue on both cassette and disk at a price of £6.00 for disk and £4.00 for cassette. None of the documentation for the programmes is supplied with the software since it is all available in the relevant magazine. Should you not have the magazine then back issues are available from the following address:

INFONET LTD, 5 River Park Estate, Berkhamsted, Herts HP4 1HL.
TEL: (0447) 7661/4.

please contact this address for prices and availability.

The Disk

Programmes on the disk will also be supplied as totally working versions, i.e. when possible we will not use Basic Loaders thus making use of the programmes much easier. Unfortunately at the moment we cannot duplicate C16 and Plus/4 cassettes. However programmes for these machines will be available on the disk.

What programmes are available?

At the top of each article you will find a strap containing the article type, C64 Program etc. So that you can see which programmes are available on which format you will also find a couple of symbols after this strap. The symbols have the following meaning:

This symbol means that the program is available on cassette.

These programs are available on disk.

Please Note

Since the programs supplied on cassette are total working versions of the program, we do not put disk-only programmes on tape. There is no sense in placing a program that expects to be reading from disk on to tape. YC

JUNE 1987

DUAL PROGRAMMING Have two programmes in your Plus/4's memory at once. (On disk only.)
EMULATOR 64 – Machine code single stepper for the C64.
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ORDER CODE
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UTILITY COMMANDS — This provides many vital commands missing from Basic 7.0 on the 128.
PLUS/4 AND C64 CRUNCHER — Speed up your programmes with these handy utilities.
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DISKIT 6 — Fast file copier for disk users. (C64 - disk only.)
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DISKIT 7 - Copy your disk programmes to turbo tape with ease. (C64 - disk only.)
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Cassettes or disks are available from March 1986. Please ring the editorial office (01-437-0626) for details of these.

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Communications Corner

David Janda is back with more news and views from the communictions world.

IN AN UNEXPECTED move, major tariff changes for the Telecom Gold system were made in early August. The good news is that the peak rate time charge is now 6.5p per minute, down from 11p, and that the off-peak rate is now 2p, down from 3.5p The bad news is that Telecom Gold has imposed a £5 per month subscription fee on every mailbox.

But by far the most controversial change is a new tariff for data transfer. Each block of 512 characters sent to or from Telecom Gold will cost the user 4p at peak time and 1p off-peak – with the first 512 characters free. This means that a 1000 word document will on average cost 48p at peak time or 12p off-peak to read or send.

The new tariff structure will affect all users across the board, especially domestic users as they will not be able to offset the cost of using Telecom Gold as a company expense. Further, domestic users tend to make extensive use of areas on Gold that rely on sending/receiving text such as Email, news areas, and on system 72 which is operated by Microlink – the bulletin board facility.

Almost overnight, the new pricing structure has changed Telecom Gold from being one of the most cost-effective databases, to one of the most expensive. For example, a user wishing to facilitate one of the on-line information services such as Fintech will have to pay the information provider a time charge for accessing the database as well as the connect charge and the data transfer charge imposed by Telecom Gold. Worse still, users accessing Gold via PSS also have to pay a data transfer charge on top of that. Add to all this the cost of the phone call to your local PSS node/Gold port and the cost begins to add up!

Micronet Goes for Gold

However, there is a way to avoid the £5 subscription fee and the cost of long distance phone calls, and yet still have access to all the facilities of Telecom Gold – by simply joining Micronet.

Interlink is the name of a 'gateway' that enables Micronet subscribers to be connected through to Telecom Gold. From within Micronet, the user goes to the Interlink front page (*401999999 or *INTERLINK) and presses '1' to make the connection. Once this is done, the user logs on by calling system 74, enters their ID and password, and is through to Telecom Gold. some clever software converts Gold's 80 column format to 40 column that's required by Prestel. At the end of each frame the user is prompted to press RETURN; the screen will then clear and more text, if any, will follow.

To use Interlink, Micronet subscribers must first register online. Once done, you will be provided with your own Telecom Gold mailbox which you can access throgh Interlink, or by accessing Telecom Gold directly. there is no registration fee and Interlink members do not have to pay the £5 subscription fee each month. There is a charge of 1p per minute for using the gateway, but when you take into account local call access for Prestel/Micronet subscribers and the waiving of the £5 subscription fee, accessing Telecom Gold via Interlink is very cost effective. Consider the following subscription charges for a period of one year:

Telecom Gold:	£60
Prestel:	£26
Micronet/Prestel:	£66

Subscribing to Telecom Gold and Prestel will cost £86 per year, yet subscribing to Micronet (which also means subscribing to Prestel as Micronet is an information providere on the Prestel database) will get you all three services for £66 – and that is exceptional value for money.

According to Micronet's PR manager, David Rosenbaum, Prestel are currently developing on an 80 column gateway which can be used *within* Prestel/Micronet, and that Micronet have made 'a mega

development in online chat facilities.' Full details on both items next month.

Compunet Changes

SEVERAL MAJOR CHANGES have happened at Compunet over the last few months. First, Compunet has 'moved' the whole database onto their new 'mainframe' computer. Previously, the service was run on a DEC 10 mainframe computer which was a timesharing system. The result was slow logon time, slow page access, slow everything. However, with their new mainframe, which consists of a series of 68020 microprocessors, things should be speeded up. New applications software has been written in C, and single processors are allocated to individual tasks such as updating the directory.

There should be several benefits to the subscriber as a result of the move. Firstly speed – the time taken to move through the database should be improved dramatically. Capacity will be doubled, allowing more people to subscribe. Facilities such as the multi-user game (MUG) Federation is now available and may soon be followed by Gods. Including MUD, this would bring the number of MUGs to three on the system. Compunet also intend to cater for micros other than the C64/C128 in the near future. The BBC micro was to have been the first of these micros, but the plan to accommodate the Beeb was abandoned earlier this year.

Finally, the cost of using Compunet has gone down – well, sort of. Previously, a subscriber could access Compunet by calling one of several numbers that were scattered around the country. These 'free' numbers have been scrapped and everyone must access the service through the Istel network. Istel prices have gone down to 1p per minute, and the cost of accessing Compunet during peak hours has gone down to 60p per hour for London users and £4 for all other users.

Gold subscribers can take out a quarterly subscription of £3.45 (inc VAT) to cover off peak connect charges.

Obviously the price reductions are a move in the right direction. But what seems unfair is the removal of the free phone numbers.

Snippit

The cost of accessing Compunet in the evening requires a local phone call to an Istel port during the off-peak period and the Istel charge; the total is £1.04 per hour (ex VAT on the phone call). Accessing Micronet in the evening requires a local call to a Prestel port in the off-peak period; this costs 44p per hour (ex VAT). There is no charge for using the Prestel network.

Touchline:
Telecom Gold: 01-403 6777.
Micronet: 01-278 3134.
Compunet: 01-997 2591.

Adventure Kit II

Continuing our adventure writing series, this month we look at everything you need to know about the text.

By Allen Webb

This month I will deal with the text; the life-blood of adventures. Since text is RAM hungry, this section will utilise the unused RAM lurking behind the ROMs. The actual code is quite small but it needs four tables occupying 1K. In order to print text, we need to know two things. First we need the start address of the text and secondly some way of knowing when the text ends.

In this case, I will use a zero byte as a sentinel to mark the end of each piece of text. Since only simple indexed addressing is used, each block of text is limited to 256 bytes. The actual text is stored in an uncompressed form to allow you the full use of characters and control codes. If you want to use compressed storage, refer to my article in *Your Commodore* (September 1987) which covers it.

How the Code works

Before I describe the editor for this section, I will give some detail on how the code works, for those of you who want to write their own editor. The syntax for the code is:

SYS 51968,BANK,MESSAGE NO,LINE

Bank refers to the block of RAM concerned and has the values:

0 = area below the BASIC ROM between 40960 ($A000) and 49151 ($BFFF)

1 = area below the Kernal ROM between 57344 ($E000) and 65535 ($FFFF)

This gives a total of about 16K for text.

MESSAGE NO is self-explanatory and has the value between 0 and 255. The editor initialises the table values to zero. If you try to call a non-existant message the zero bytes are detected and you get a flashing border to warn you of your error. This action does not, however, termminate execution of your BASIC program.

LINE refers the starting line for the message. The normal scrolling as occurs with PRINT will be envoked.

The memory used by the code is as follows:

$CB00-$CBFF....main code
$CC00-$CCFF....low byte table for BASIC ROM area

$CBOO-$CBFF....main code
$CCOO-$CCFF....low byte table for BASIC ROM area
$CDOO-$CDFF....high byte table for BASIC ROM area
$CEOO-$CEFF....low byte table for KERNAL ROM area
$CFOO-$CFFF....high byte table for KERNAL ROM area

The start addresses of each message are kept in the above tables. For example, the low byte (LB) of the start address of message 1 under the BASIC ROM is held in location $CC01 (52225). Similarly, the high byte (HB) is in $CD01. The start address of the message is then given by:

Address = HB x 256 +LB

The editor given seems rather disproportionately large for the code it serves, but my reasons for using mostly machine code are simple. Any text editor written in BASIC will be sluggish and the other operations involved will give an unwieldy program. The main editor is called by a short lump of BASIC. It is driven by a main menu screen which also gives help and shows the current memory usage in each blank.

The two memory banks are handled separately and you can only work on one at a time. You can toggle between them by pressing F1, and the border colour will change accordingly. This option is selected from the main menu only. Subsequent actions such as initialisation and text entry act on the current bank.

The Text Editor

The editor screen carries three blocks of information. First, at the top of the screen you are shown the length of the message being typed in. The text buffer shows the actual RAM contents. This allows you to see control codes, etc. This buffer is filled with zero bytes (the '@' characters). Because a zero byte is used as a sentinel, you may not use the character '@' in yout text.

The bottom buffer shows how the text will look on screen. This buffer is updated each time a key is pressed. The normal colour and reverse field keys are available so you can get the effect you want. Once RETURN is pressed, the text is stored in RAM. Once this is done, you can't change the message – so beware! When RETURN is pressed, the editor will wait for a key press. Press "←" if you want to return to the main menu or any other key to deal with the next message.

The restriction on editing messages once entered was forced on me if I wanted to keep the code to a reasonable length. If you work everything out on paper first (as you should) this shouldn't be a limitation.

The saving and loading of text presents slight complications. Since the text is hiding behind ROMs, direct saving and loading was not possible. As it is, cassette users will find it awkward to load to these areas. The MOVER code does this job. It compacts the required text bank into lower memory as follows:

\$5000-\$6FFF.......	text
\$7000-\$7200........	address tables
\$7201............	number of messages
\$7202,\$7203....	end address+1 of text

This handy block is easier to save and load. The MOVER code has four entry points:

SYS 49152 . Download BASIC ROM area
SYS 49155Upload BASIC ROM area
SYS 49158 . Download Kernal ROM area
SYS 49161 Upload Kernal ROM area

You may need to incorporate this code in the loader to your adventure, unless you use a machine code monitor to save code (although this will occupy more than one file).

To use the editor, you must have the following code in memory:

1. The text code.
2. The MOVER code.
3. The Editor code.

If this seems all a bit involved, fear not, I will give a loader at the end of this series which will load all the data blocks for you although, inevitably, this will be separate to your main adventure code. More on that later on.

One last point about the text editor. If you use the RVS ON control code to highlight part of your text, you will note that the whole of your text will be printed in reverse. Fear not, provided that you include a RVS OFF at the required place, all will be well. This is simply a foible of the way the editor works. YC

See Listings on page 125

Listings

Get it right first time with our deluxe program system for the C64.

You may have noticed that our listings are free of those horrible little black blobs which send you searching around the keyboard for a suitable graphic symbol. You may also have noticed the funny numbers by the side of each line of the listing. Fret no more, it's all part of our easy entry aid.

Instead of those nasty graphics and rows of countless spaces in PRINT statements and strings we use a special coding system. The code, or mnemonic, is always contained in square brackets and you'll soon learn to decipher their meanings.

For example, [SA] would mean type in a Shifted A, or an ace of spades in layman's terms, and [SA10] would mean a row of ten of these symbols.

[S+2] means hold down the shift key and press the plus key twice. It doesn't take a great leap of logic to realise that [C+2] means exactly the same thing except that the Commodore key (bottom left of the keyboard) is held down instead of the shift key.

If more than two spaces appear in a statement then this will be printed as [SPC4] or, exceptionally, [SSPC4]. Translated into English this means press the spacebar four times or in the latter case hold the shift key down while you do it.

A string of special characters could appear as:
[CTRL .N, DOWN2,LEFT5,BLUE, F3,C3]

This would be achieved by holding down the CTRL key as you press N, press the cursor key down twice, the cursor left key five times, press the key marked BLUE while holding down the CTRL key, press the F3 key and, finally hold the Commodore key down while pressing the number two key (C2 would of course make the computer print in brown).

Always remember that you should only have a row of graphics characters on your screen with no square brackets and no commas, unless something like this appears:
[SS],[C*]
In this case the two characters should have a comma between them.

On rare occasions [REV T] will appear in a listing. This is a delete symbol and is created by entering the line up to this mnemonic. Then type a closing quotation mark (SHIFT & 2) and delete it. This gets the computer out of quotes mode. Hold down CTRL and press the number nine key (RVSON), type the relevant number of reversed T's and then hold down CTRL and press zero (RVSOFF). Next type another quotation mark and delete it again. Now finish the line and press RETURN.

A list of these special cases is given in the table but remember that only one of these mnemonics will appear outside of a PRINT string: the symbol for pi. This may appear when its value is needed in a calculation so this may look something like:
:CC=2*[PI]*R:
Ignore the square brackets and just type in a shifted upward pointing arrow (ie. the pi symbol).

PROGRAM: SYNTAX CHECKER

```
5 REM SYTAX CHECKER - ERIC DOYLE

10 BL=10    :LN=70    :SA=49152
20 FOR L=0 TO BL:CX=0:FOR D=0 TO
 15
30 READ A:IF A>255THENPRINT"NUMB
ER TO LARGE";LN+(L*10):STOP
40 CX=CX+A:POKE SA+L*16+D,A:NEXT
 D
50 READ A:IF A><CX THENPRINT"ERR
OR IN LINE";LN+(L*10):STOP
60 NEXT L:SYS 49152:NEW
70 DATA 173,5,3,201,165,208,31,1
20,169,9,141,32,208,141,33,208,1
847
80 DATA 169,7,141,134,2,169,13,3
2,210,255,169,64,141,4,3,169,168
2
90 DATA 192,141,5,3,88,96,120,16
9,124,141,4,3,169,165,141,5,1566

100 DATA 3,169,14,141,134,2,141,
32,208,169,6,141,33,208,88,96,15
85
110 DATA 32,124,165,72,138,72,15
2,72,162,0,165,20,133,254,165,21
,1747
120 DATA 24,101,254,133,254,189,
0,2,240,18,69,254,133,254,232,18
9,2346
130 DATA 0,2,240,8,24,101,254,13
3,254,232,208,233,169,1,141,134,
2134
140 DATA 2,165,254,74,74,74,74,3
2,156,192,32,210,255,165,254,41,
2054
150 DATA 15,32,156,192,32,210,25
5,169,13,32,210,255,169,13,32,21
0,1995
160 DATA 255,169,7,141,134,2,104
,168,104,170,104,96,24,105,48,20
1,1832
170 DATA 58,16,1,96,24,105,7,96,
0,0,0,0,0,0,0,0,403
```

by Eric Doyle

Checksum Program

The hexadecimal numbers appearing in a column to the left of the listing should not be typed in with the program. These are merely checksum values and are there to help you get each line right. Don't worry if you don't understand the hexadecimal system, as long as you can compare two characters on the screen with the corresponding two characters in the magazine you can use our line checking program.

Type in the Checksum Program, make sure that you've not made any mistakes and save it to tape or disk immediately because it will be used with most of the present and future listings appearing in Your Commodore.

At the start of each programming session, load Checksum and run it. The screen will turn brown with yellow characters and each time you type in a line and press the RETURN key a number will appear on the screen in white. This should be the same as the corresponding value in the magazine.

If the two values don't relate to one another, you have not copied the line exactly as printed so go back and check each character carefully. When you find the error simply correct it and press RETURN again.

If you want to turn off the checker simply type SYS49152 and the screen will return to the familiar blue colours. You can then do whatever it was you wanted to do and if this doesn't use the area where Checksum lies you can go back to it with the same SYS command.

Lower Case

Many of the listings are presented in lower case. To turn your computer to lower case mode press the Commodore key and the SHIFT key at the same time. YC

Mnemonic	Symbol	Keypress
[RIGHT]		CRSR left/right
[LEFT]		SHIFT & CRSR left/right
[DOWN]		CRSR up/down
[UP]		SHIFT & CRSR up/down
[F1]		f1 key
[F2]		SHIFT & f1 key
[F3]		f3 key
[F4]		SHIFT & f3 key
[F5]		f5 key
[F6]		SHIFT & f5 key
[F7]		f7 key
[F8]		SHIFT & f7 key
[HOME]		CLR/HOME
[CLR]		SHIFT & CLR/HOME
[RVSON]		CTRL & 9
[RVSOFF]		CTRL & 0

Mnemonic	Symbol	Keypress
[BLACK]		CTRL & 1
[WHITE]		CTRL & 2
[RED]		CTRL & 3
[CYAN]		CTRL & 4
[PURPLE]		CTRL & 5
[GREEN]		CTRL & 6
[BLUE]		CTRL & 7
[YELLOW]		CTRL & 8
[POUND]		£
[LARROW]		←
[UPARROW]		↑
[PI]		SHIFT & ↑
[INST]		SHIFT & INST/DEL
[REV T]		see text
[Cletter]		CBM + letter
[Sletter]		SHIFT + letter

DISKIT 8

Please refer to Listings before typing in any programs.

```
PROGRAM: MEM CLEAR BOOT
```

```
 READY.
43   10 M1=32768:M2=34992:CH=0
97   11 PRINTCHR$(144)CHR$(147)
A2   12 POKE53280,15:POKE53281,12
94   13 PRINT"
8F   14 PRINTSPC(8)CHR$(18)"[SU,S*
     22,SI]
26   15 PRINTSPC(8)CHR$(18)"[S-,SP
     C22,S-]
B4   16 PRINTSPC(8)CHR$(18)"[S-,SP
     C4]DATA  STATEMENT[SPC3,S-]
3C   17 PRINTSPC(8)CHR$(18)"[S-,SP
     C22,S-]
E5   18 PRINTSPC(8)CHR$(18)"[S-]
     TO MEMORY  ROUTINE  [S-]
4A   19 PRINTSPC(8)CHR$(18)"[S-,SP
     C22,S-]
22   20 PRINTSPC(8)CHR$(18)"[S-,SP
     C5]BY LES ALLAN[SPC5,S-]
50   21 PRINTSPC(8)CHR$(18)"[S-,SP
     C22,S-]
6C   22 PRINTSPC(8)CHR$(18)"[SJ,S*
     22,SK]
A0   23 PRINT:PRINTCHR$(155)
42   24 PRINT" THIS ROUTINE READS
     THE DATA STATEMENT,"
80   25 PRINT
17   26 PRINT" CONVERTS FROM  HEX
     TO BINARY AND POKES"
82   27 PRINT
C4   28 PRINT" CODE BACK  TO THE
     AREA OF MEMORY FROM"
84   29 PRINT
19   30 PRINT" WHICH  IT  WAS  PRE
     VIOUSLY  GENERATED."
59   31 PRINT:PRINT
D0   32 READCODE$
BB   33 LB=ASC(RIGHT$(CODE$,1))-48
     :IFLB>9THENLB=LB-7
CF   34 HB=ASC(LEFT$(CODE$,1))-48:
     IFHB>9THENHB=HB-7
A5   35 CH=CH+LB+HB
37   36 PRINTSPC(5)CHR$(5)"READING
      MEMORY BLOCK ...";M1:PRINTCH
     R$(145);
95   37 POKEM1,HB*16+LB:M1=M1+1:IF
     M1<M2THEN32
E6   38 IFCH<>27136THENPRINTCHR$(1
     47)"ERROR IN CHECKSUM!!!!":E
     ND
5F   39 SYS34896
12   40 :
2A   41 ::::::::::DATUM STATEMENTS
     :::::::::
10   42 :
9F   43 DATA 00,0B,08,01,00,9E,34,
     30,38,30,00,00,00,45,47,D0
39   44 DATA 72,74,75,7F,77,6B,76,
     72,7D,D0,72,74,75,7F,76,6B
16   45 DATA 76,75,47,76,4F,44,47,
     DE,80,6F,76,73,70,6E,7D,DE
F5   46 DATA 47,1E,4F,43,47,DE,E1,
     71,6E,65,D7,55,92,84,84,84
60   47 DATA 84,84,84,84,84,84,84,
     84,84,84,84,84,84,84,84,84
73   48 DATA 84,84,84,84,84,84,84,
     8E,47,C7,4F,42,47,DE,E1,71
30   49 DATA 6E,65,55,9A,67,67,67,
     67,67,67,67,67,67,67,67,67
28   50 DATA 67,67,67,67,67,67,67,
     67,67,67,67,67,67,67,9A,47
69   51 DATA E0,4F,41,47,DE,E1,71,
     6E,65,55,9A,67,67,67,67,67
9B   52 DATA 67,67,67,67,67,67,67,
     67,67,67,67,67,67,67,67,67
21   53 DATA 67,67,67,67,67,9A,47,
     89,4F,40,47,DE,E1,71,6E,65
F7   54 DATA 55,9A,67,67,67,67,E7,
     0A,02,0A,08,15,1E,67,67,06
40   55 DATA 0B,0B,67,04,0B,02,06,
     15,67,67,67,67,9A,47,B2,4F
E8   56 DATA 4F,47,DE,E1,71,6E,65,
     55,9A,67,67,67,67,67,67,67
6E   57 DATA 67,67,67,67,67,67,67,
     67,67,67,67,67,67,67,67,67
86   58 DATA 67,67,67,9A,47,5B,4E,
     4E,47,DE,E1,71,6E,65,55,9A
6C   59 DATA 67,67,67,67,67,67,67,
     67,67,67,67,67,67,67,67,67
38   60 DATA 67,67,67,67,67,67,67,
     67,67,67,9A,47,04,4E,4D,47
19   61 DATA DE,E1,71,6E,65,55,9A,
     67,67,E7,10,15,0E,13,13,02
7A   62 DATA 09,67,05,1E,67,0B,02,
     14,67,06,0B,0B,06,09,67,67
16   63 DATA 67,9A,47,2D,4E,4C,47,
     DE,E1,71,6E,65,55,9A,67,67
A7   64 DATA 67,67,67,67,67,67,67,
     67,67,67,67,67,67,67,67,67
5E   65 DATA 67,67,67,67,67,67,67,
     67,9A,47,D6,4E,4B,47,DE,E1
14   66 DATA 71,6E,65,55,9A,67,67,
     67,67,67,67,67,67,67,67,67
07   67 DATA 67,67,67,67,67,67,67,
     67,67,67,67,67,67,67,67,9A
C5   68 DATA 47,FE,4E,4A,47,DE,E1,
     71,6E,65,55,8D,84,84,84,84
7A   69 DATA 84,84,84,84,84,84,84,
     84,84,84,84,84,84,84,84,84
04   70 DATA 84,84,84,84,84,84,8C,
     DC,47,86,4E,49,47,DE,7D,DE
13   71 DATA 47,A8,4E,48,47,DE,65,
     67,67,13,0F,0E,14,67,17,15
F5   72 DATA 08,00,15,06,0A,67,01,
     0E,0B,0B,14,67,0A,02,0A,08
C8   73 DATA 15,1E,67,01,15,08,0A,
     67,63,77,7F,77,77,65,47,5A
E3   74 DATA 4D,57,47,DE,65,67,67,
     13,08,67,63,01,01,01,01,67
E2   75 DATA 10,0E,13,0F,67,63,77,
     77,67,14,08,67,67,13,0F,06
62   76 DATA 13,67,67,10,0F,02,09,
     67,13,0F,02,65,47,0C,4D,56
7E   77 DATA 47,DE,65,67,67,17,15,
     08,00,15,06,0A,67,14,06,11
80   78 DATA 02,03,67,67,10,0E,13,
     0F,67,67,0A,02,0A,08,15,1E
A9   79 DATA 67,14,06,11,02,15,67,
     0E,14,65,47,3E,4D,55,47,DE
24   80 DATA 65,67,67,04,15,12,09,
     04,0F,02,03,67,67,04,08,0A
96   81 DATA 0A,08,09,67,67,04,08,
     03,02,67,0E,14,67,15,02,03
F6   82 DATA 12,04,02,03,67,13,08,
     65,47,E0,4D,54,47,DE,65,67
75   83 DATA 67,17,15,08,03,12,04,
     02,67,67,06,67,67,14,0A,06
02   84 DATA 0B,0B,02,15,67,67,10,
     08,15,0C,0E,09,00,67,17,15
3F   85 DATA 08,00,15,06,0A,65,47,
     E8,4D,53,47,DE,7D,DE,47,9A
3F   86 DATA 4D,52,47,DE,65,67,67,
     12,14,02,67,67,13,0F,0E,14
89   87 DATA 67,67,10,0E,13,0F,67,
     0A,02,0A,08,15,1E,67,14,06
5C   88 DATA 11,02,15,67,06,09,03,
     67,08,09,02,65,47,4C,4C,51
9F   89 DATA 47,DE,65,67,67,17,06,
     15,13,67,0A,06,0C,02,15,67
95   90 DATA 13,08,67,14,0E,0A,17,
     0B,0E,01,1E,67,14,06,11,02
D4   91 DATA 67,15,08,12,13,0E,09,
     02,14,65,47,5A,4C,50,47,CC
FC   92 DATA 85,6F,76,7E,70,6E,F5,
     71,73,E0,75,74,47,6E,4C,5F
5F   93 DATA 47,DE,80,6F,76,73,70,
     6E,47,15,4C,5E,47,DE,65,67
29   94 DATA 67,76,69,67,67,67,0B,
     08,06,03,67,61,67,15,12,09
39   95 DATA 67,0A,02,0A,08,15,1E,
     67,06,0B,0B,67,04,0B,02,06
0C   96 DATA 15,47,C7,4C,5D,47,DE,
     7D,DE,65,67,67,75,69,67,67
19   97 DATA 67,0B,08,06,03,67,0E,
     09,67,17,15,08,00,15,06,0A
8B   98 DATA 67,01,08,15,67,04,08,
     09,11,02,15,14,0E,08,09,47
00   99 DATA F7,4C,5C,47,DE,7D,DE,
     65,67,67,74,69,67,67,67,0B
82   100 DATA 08,06,03,67,60,0A,02
     ,0A,76,60,6B,7F,6B,76,67,61
CB   101 DATA 67,0B,08,06,03,60,0A
     ,02,0A,75,60,6B,7F,6B,76,47
65   102 DATA 98,4C,5B,47,DE,7D,DE
     ,65,67,67,73,69,67,67,67,06
18   103 DATA 03,03,67,14,1E,14,67
     ,04,08,03,02,67,6F,0E,69,02
17   104 DATA 69,67,67,77,67,14,1E
     ,14,67,75,77,71,76,6E,47,4B
D5   105 DATA 4B,5A,47,DE,7D,DE,65
     ,67,67,72,69,67,67,67,14,1E
52   106 DATA 14,67,7F,75,7F,67,13
     ,08,67,14,06,11,02,67,60,0A
C6   107 DATA 06,0E,09,60,67,60,0C
     ,02,15,09,60,47,65,4B,59,47
F1   108 DATA DE,65,67,67,67,67,67
     ,67,67,61,67,60,05,08,08,13
72   109 DATA 60,47,17,4B,58,47,DE
     ,7D,DE,65,67,67,71,69,67,67
1E   110 DATA 67,04,15,12,09,04,0F
     ,67,60,0A,06,0E,09,60,67,01
09   111 DATA 0E,0B,02,67,06,09,03
     ,67,0E,01,67,0B,02,14,14,47
9C   112 DATA 3A,4B,67,47,DE,65,67
     ,67,67,67,67,67,67,13,0F,06
D9   113 DATA 09,67,76,72,73,67,05
     ,0B,08,04,0C,14,67,12,14,02
BB   114 DATA 67,08,09,02,67,17,06
     ,15,13,67,11,76,47,E5,4B,66
94   115 DATA 47,DE,65,67,67,67,67
     ,67,67,67,13,08,67,14,06,11
10   116 DATA 02,67,04,08,0A,17,0B
     ,02,13,02,67,0A,02,0A,08,15
5C   117 DATA 1E,47,8A,4B,65,47,DE
     ,7D,DE,65,67,67,67,67,67,67
E8   118 DATA 67,0E,01,67,04,0F,06
     ,15,06,04,13,02,15,67,15,06
41   119 DATA 0A,67,12,09,12,14,02
     ,03,67,06,09,03,47,B0,4B,64
13   120 DATA 47,DE,65,67,67,67,67
     ,67,67,67,04,15,12,09,04,0F
38   121 DATA 02,03,67,60,0A,06,0E
     ,09,60,67,01,0E,0B,02,67,0E
69   122 DATA 14,67,0B,02,14,14,47
     ,63,4A,63,47,DE,65,67,67,67
4A   123 DATA 67,67,67,67,13,0F,06
     ,09,67,76,70,77,67,05,0B,08
3D   124 DATA 04,0C,14,67,12,14,02
     ,67,08,09,02,67,17,06,15,13
49   125 DATA 67,11,75,47,09,4A,62
     ,47,DE,7D,DE,65,67,67,70,69
40   126 DATA 67,67,67,0B,08,06,03
     ,67,60,0A,02,0A,74,60,67,08
6A   127 DATA 15,67,60,0A,02,0A,73
     ,60,67,6B,7F,6B,76,47,3A,4A
2A   128 DATA 61,47,DE,7D,DE,65,67
     ,67,7F,69,67,67,67,14,1E,14
B0   129 DATA 67,7F,75,7F,67,13,08
     ,67,04,15,02,06,13,02,67,08
B1   130 DATA 09,02,67,17,06,15,13
     ,67,01,0E,0B,02,47,C8,4A,6F
F8   131 DATA 47,CC,85,6F,76,7E,70
     ,6E,F5,71,73,E0,73,77,47,DD
F0   132 DATA 4A,6E,47,D9,67,73,76
     ,76,7F,47,E7,4A,6D,47,7D,47
E5   133 DATA 8F,4A,6C,47,7D,7D,7D
     ,7D,7D,7D,7D,7D,7D,7D,7D,7D
39   134 DATA 7D,7D,7D,7D,7D,7D,7D
     ,7D,7D,7D,7D,7D,7D,7D,7D,7D
E9   135 DATA 7D,7D,7D,7D,7D,7D,7D
     ,47,B7,4A,6B,47,7D,7D,7D,7D
7F   136 DATA 7D,7D,7D,7D,7D,7D,7D
     ,7D,7D,7D,7D,7D,7D,7D,7D,7D
C0   137 DATA 7D,7D,7D,7D,7D,7D,7D
     ,7D,7D,7D,7D,7D,7D,7D,7D,47
33   138 DATA 5F,49,6A,47,7D,7D,67
     ,67,67,67,67,67,67,67,67,67
BC   139 DATA 67,67,67,67,67,67,67
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    ,67,67,67,67,67,67,67,67,67
4D  140 DATA 67,67,67,67,67,7D,7D
    ,47,78,49,69,47,7D,7D,67,67
FB  141 DATA 67,0A,02,0A,F7,1E,67
    ,67,06,0B,0B,67,04,0B,02,06
C7  142 DATA 15,67,17,15,08,00,15
    ,06,0A,67,67,67,7D,7D,47,20
99  143 DATA 49,68,47,7D,7D,67,67
    ,67,67,67,67,67,67,67,67,67
F7  144 DATA 67,67,67,67,67,67,67
    ,67,67,67,67,67,67,67,67,67
5B  145 DATA 67,67,67,67,7D,7D,47
    ,C8,49,77,47,7D,7D,67,67,67
C8  146 DATA 10,15,0E,13,13,02,09
    ,67,05,1E,67,67,67,67,67,67
73  147 DATA 0B,02,14,67,06,0B,0B
    ,06,09,67,67,67,7D;7D,47,F0
9F  148 DATA 49,76,47,7D,7D,67,67
    ,67,67,67,67,67,67,67,67,67
CA  149 DATA 67,67,67,67,67,67,67
    ,67,67,67,67,67,67,67,67,67
DB  150 DATA 67,67,67,67,7D,7D,47
    ,9A,49,75,47,7D,7D,67,67,67
35  151 DATA 75,7F,67,06,13,0C,0E
    ,09,14,D6,67,03,15,0E,11,02
10  152 DATA 67,67,09,60,17,F7,13
    ,67,67,67,7D,7D,47,42,48,74
FA  153 DATA 47,7D,7D,67,67,67,67
    ,67,67,67,67,67,67,67,67,67
FD  154 DATA 67,67,67,67,67,67,67
    ,67,67,67,67,67,67,67,67,67
AB  155 DATA 20,20,3A,3A,00,2D,0F
    ,34,00,3A,3A,3A,3A,3A,3A,3A
13  156 DATA 3A,3A,3A,3A,3A,3A,3A
    ,3A,3A,3A,3A,3A,3A,3A,3A,3A
C6  157 DATA 3A,3A,3A,3A,3A,3A,3A
    ,3A,3A,3A,3A,3A,00,55,0F,35
A3  158 DATA 00,3A,3A,3A,3A,3A,3A
    ,3A,3A,3A,3A,3A,3A,3A,3A,3A
70  159 DATA 3A,3A,3A,3A,3A,3A,3A
    ,3A,3A,3A,3A,3A,3A,3A,3A,3A
B2  160 DATA 3A,3A,3A,3A,00,00,00
    ,38,00,3A,3A,3A,3A,3A,3A,3A
F6  161 DATA 3A,3A,3A,3A,3A,3A,3A
    ,3A,3A,3A,3A,3A,3A,3A,3A,3A
B0  162 DATA 3A,3A,3A,3A,3A,3A,3A
    ,3A,3A,3A,3A,3A,00,00,00,38
20  163 DATA 00,3A,3A,3A,3A,3A,3A
    ,3A,3A,3A,3A,3A,3A,3A,3A,3A
1B  164 DATA 3A,3A,3A,3A,3A,3A,3A
    ,3A,3A,3A,3A,3A,3A,3A,3A,3A
EF  165 DATA 3A,3A,3A,3A,00,00,00
    ,38,00,3A,3A,3A,3A,3A,3A,3A
19  166 DATA 3A,3A,3A,3A,3A,3A,3A
    ,3A,3A,3A,3A,3A,3A,3A,3A,3A
50  167 DATA 3A,3A,3A,3A,3A,3A,3A
    ,3A,3A,3A,3A,3A,00,00,00,00
4D  168 DATA 00,00,EE,EE,EE,EE,EE
    ,EE,EE,EE,EE,EE,EE,EE,EE,EE
8E  169 DATA EE,EE,EE,EE,EE,EE,EE
    ,EE,EE,EE,EE,EE,EE,EE,EE,EE
80  170 DATA A9,23,8D,0B,08,A9,08
    ,8D,0C,08,A9,00,85,FB,A9,08
88  171 DATA 85,FC,A0,0D,B1,FB,49
    ,47,91,FB,C8,D0,F7,E6,FC,A5
22  172 DATA FC,C9,0F,D0,EF,60,A2
    ,00,BD,26,10,9D,A7,02,E8,E0
22  173 DATA 59,D0,F5,4C,A7,02,78
    ,A9,34,85,01,A9,00,85,FB,A2
72  174 DATA 08,86,FC,91,FB,C8,D0
    ,FB,E6,FC,D0,F7,A9,37,85,01
BD  175 DATA 58,4C,66,FE,00,00,00
    ,00,00,00,00,00,00,00,00,00
4D  176 DATA A9,00,A8,85,FB,85,FD
    ,A9,80,85,FC,A9,08,85,FE,B1
7F  177 DATA FB,91,FD,C8,D0,F9,E6
    ,FC,E6,FE,A5,FC,C9,A0,D0,EF
5F  178 DATA A9,08,AA,A8,20,BA,FF
    ,A9,0C,A2,94,A0,88,20,BD,FF
84  179 DATA A9,01,85,2B,A9,08,85
    ,2C,A9,2B,A2,50,A0,10,20,D8
32  180 DATA FF,4C,66,FE,4D,45,4D
    ,4F,52,59,20,43,4C,45,41,52
AA  181 DATA 00,00,00,00,00,00,00
    ,00,00,00,00,00,00,00,00,00
8C  182 :
8D  183 :
80  184 ::::::::::::::::::::::::::
    :::::::::::
06  185 :  MEMORY ALL CLEAR  BY L
    ES ALLAN  :
BA  186 :
                   :
22  187 : KIND ASSISTANCE BY GAVI
    N SELLMAN :
8B  188 : FOR HIS 64 WHEN MINE WA
    S BROKEN! :
C1  189 :
                   :
BF  190 :   28 ATKINSON DRIVE NEW
    PORT IW    :
BF  191 :
                   :
08  192 ::::::::::::::::::::::::::
    :::::::::::
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KERNAL II

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PROGRAM: KERNAL II
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34  1 REM BASIC LOADER FOR KERNA
    L II M/C
8F  2 REM CAN BE SAVED AS A M/C
    FILE FROM
96  3 REM WITHIN THE PROGRAM USI
    NG
BA  4 REM SAVE AND ELSE OPTIONS.

9E  5 REM START ADDRESS: $8000
DB  6 REM END ADDRESS   : $92BD
3D  7 :
5F  10 FORX=32768 TO 37552:READA
    :POKEX,A:NEXT
20  1000 DATA27,129,184,129,195,
    194,205,56,48,80,65
60  1010 DATA84,82,73,67,75,32,6
    7,72,65,66,76
E7  1020 DATA69,32,45,32,40,67,4
    1,32,70,82,65
23  1030 DATA78,67,69,32,49,57,5
    6,55,32,45,40
1B  1040 DATA4,80,4,120,4,160,4,
    200,4,240,4
DF  1050 DATA24,5,45,4,85,4,125,
    4,165,4,50
E1  1060 DATA4,90,4,130,4,170,4,
    220,4,4,5
F7  1070 DATA44,5,84,5,124,5,164
    ,5,204,5,245
E6  1080 DATA4,29,5,69,5,109,5,1
    49,5,189,5
88  1090 DATA229,5,132,4,172,4,2
    12,4,252,4,36
83  1100 DATA5,76,5,116,5,156,5,
    196,5,236,5
F3  1110 DATA20,6,60,6,100,6,140
    ,6,221,6,5
0A  1120 DATA7,45,7,85,7,184,4,2
    24,4,8,5
C2  1130 DATA48,5,88,5,128,5,168
    ,5,208,5,248
B3  1140 DATA5,65,6,105,6,145,6,
    131,6,171,6
81  1150 DATA211,6,251,6,169,4,2
    09,4,249,4,33
9E  1160 DATA5,73,5,113,5,153,5,
    193,5,233,5
DD  1170 DATA17,6,57,6,97,6,137,
    6,177,6,217
41  1180 DATA6,1,7,0,0,0,0,0,0,0
    ,0
3A  1190 DATA0,0,0,0,0,0,0,0,0,0
    ,1
61  1200 DATA254,0,1,252,0,1,248
    ,0,1,252,0
BC  1210 DATA1,254,0,1,255,0,1,1
    91,128,1,31
2B  1220 DATA192,0,15,128,0,7,0,
    0,2,0,0
A1  1230 DATA0,0,0,0,0,0,0,0,0,0
    ,0
77  1240 DATA160,132,137,147,139
    ,160,148,129,144,133,160
A5  1250 DATA143,144,148,137,143
    ,142,147,160,142,22,208
F6  1260 DATA32,163,253,32,80,25
    3,32,21,253,32,91
A8  1270 DATA255,169,0,141,32,20
    8,141,33,208,141,253
49  1280 DATA151,141,254,151,169
    ,1,141,134,2,141,252
C0  1290 DATA151,162,0,189,201,1
    28,157,192,2,232,224
DA  1300 DATA62,208,245,169,11,1
    41,255,7,169,176,141
A9  1310 DATA14,208,169,143,141,
    15,208,169,128,141,21
E1  1320 DATA208,162,0,189,8,129
    ,157,66,150,232,224
0F  1330 DATA19,208,245,120,169,
    161,141,24,3,169,129
36  1340 DATA141,25,3,169,195,14
    1,22,3,169,129,141
C5  1350 DATA23,3,169,254,141,20
    ,3,169,129,141,21
31  1360 DATA3,169,0,133,2,141,8
    8,150,88,24,162
50  1370 DATA0,160,128,32,153,25
    5,108,0,160,96,72
37  1380 DATA138,72,152,72,169,1
    27,141,13,221,172,13
0E  1390 DATA221,48,16,32,2,253,
    208,3,108,2,128
A7  1400 DATA32,188,246,32,225,2
    55,240,3,76,114,254
52  1410 DATA32,163,253,32,24,22
    9,162,0,189,8,129
02  1420 DATA157,66,150,232,224,
    19,208,245,169,0,133
D6  1430 DATA2,169,160,141,14,20
    8,169,143,141,15,208
25  1440 DATA169,128,141,21,208,
    173,253,151,141,32,208
94  1450 DATA173,254,151,141,33,
    208,173,252,151,141,134
8D  1460 DATA2,108,2,160;32,78,1
    31,32,96,130,208
CC  1470 DATA11,173,88,150,208,3
    ,32,160,141,76,49
6A  1480 DATA234,32,38,131,32,12
    3,131,240,237,165,2
AC  1490 DATA48,233,9,128,133,2,
    162,0,142,24,212
AF  1500 DATA32,3,132,169,0,32,1
    44,255,173,15,208
52  1510 DATA105,8,141,15,208,17
    3,149,2,48,17,173
33  1520 DATA149,2,201,64,240,20
    ,169,132,72,169,124
A1  1530 DATA72,169,32,72,64,169
    ,133,72,169,139,72
40  1540 DATA169,32,72,64,169,13
    4,72,169,94,72,169
D2  1550 DATA32,72,64,173,0,220,
    41,31,141,19,3
26  1560 DATA201,15,208,5,169,25
    5,76,37,131,173,19
94  1570 DATA3,41,3,201,2,144,5,
    240,19,76,156
07  1580 DATA130,173,15,208,201,
    241,144,3,76,150,130
5D  1590 DATA238,15,208,76,156,1
    30,173,15,208,201,48
D9  1600 DATA176,3,76,29,131,206
    ,15,208,173,19,3
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11   1610 DATA41,12.201,8,144.5.2
     40,64,76,29,131
D5   1620 DATA173,16,208,41,128,2
     01,128,208,26,173,14
F2   1630 DATA208,201,80,208,13.1
     69,0,141,14,208,173
53   1640 DATA16,208,41,127,141,1
     6,208,238,14,208,76
22   1650 DATA29,131,173.14,208,2
     01,255,208.13,173,16
2B   1660 DATA208,9,128,141,16,20
     8,169,0,141,14,208
24   1670 DATA238,14,208,76,29,13
     1,173,16,208,41,128
75   1680 DATA201,128,208,24,173,
     14.208,208,13,173,16
E4   1690 DATA208,73,128.141,16,2
     08,169,255,141,14,208
83   1700 DATA206,14,208,76,29,13
     1,173,14,208,208,13
BC   1710 DATA169,80,141.14,208,1
     73,16,208,9,128,141
4A   1720 DATA16,208,206,14,208,1
     73,134,2,141,46,208
16   1730 DATA169,0,96,173,15,208
     ,56,233,43,24,74
07   1740 DATA24,74.24,74,133,189
     ,173,14,208,56,233
0A   1750 DATA17,24,74,24,74.24,7
     4,174,16,208,16
58   1760 DATA6,201,30,176,2,105,
     32.133,182,96,162
52   1770 DATA0,189,66,150,157,0,
     4,173.134,2,157
25   1780 DATA0,216,232.224,19,20
     8,239,169,160,157,0
A9   1790 DATA4,173,134,2,157,0,2
     16,232,224,40,208
7B   1800 DATA240,165,214,208,5,1
     69,17.32,210,255,96
17   1810 DATA165,189,240.3,169,0
     ,96,165,182,201,18
F4   1820 DATA176,247,165,182,201
     ,10,176,44,165,182,201
FE   1830 DATA5,176,22,165,182,24
     0,231,169,4,141,147
3E   1840 DATA2,169,1,141.148,2,1
     69,0,141,149,2
EB   1850 DATA169,255,96,169,4,14
     1,147,2,169,6,141
4E   1860 DATA148,2,169,128,141,1
     49,2,96,169,7,141
D3   1870 DATA147,2,169,11,141,14
     8,2,169,64,141,149
14   1880 DATA2,96,169,0,133,251,
     133,253,133,247,133
6A   1890 DATA249,169,156,133,254
     ,169,4,133,252,169,216
C4   1900 DATA133.248,169,152,133
     ,250,160,0,162,4,177
36   1910 DATA251,145,253.177,247
     ,41,15,145,249,200,208
B9   1920 DATA243,230,252,230,254
     ,230,250,230,248,160,0
BB   1930 DATA202,208,230,96,173,
     148,2,170,173,147,2
30   1940 DATA168,189,66,150.73,1
     28,157,66,150,232,136
5E   1950 DATA208,244,96,66,12,15
     ,1,4,32,32,32
2A   1960 DATA32,32,225,66,19.1,2
     2,5,32,32,32
06   1970 DATA32,32,225,66,22,5,1
     8,9,6,25,32
C9   1980 DATA32,32,225,66,5,18.1
     8,15,18,32,32
21   1990 DATA32,32,225,66.4,9.18
     ,5,3,20,15
50   2000 DATA18.25,225,66,3.15,1
     3,13,1,14,4
70   2010 DATA32,32,225,109,98,98
     ,98,98,98,98,98
8C   2020 DATA98,98,254,169,7,141
     ,167,2,169,11,141
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59   2030 DATA168,2,169,0,141,169.
     ,2,162,132,160,24
4B   2040 DATA32,215,134,96,173,1
     3,220,32,43,140,32
2D   2050 DATA202,131,32,101,132,
     32,38,131,173,0,220
30   2060 DATA41,16,240,60,165,18
     9,205,170,2,240,239
B4   2070 DATA32,101,132,165,189,
     240,118,201,7,176,228
E4   2080 DATA165,182,240,224,201
     ,10,176,220,165,189,141
1F   2090 DATA170,2,56,233,1,10,1
     70,189,43,128,133
81   2100 DATA251,232,189,43,128,
     133,252,160,9,177,251
E8   2110 DATA73,128,145,251,136,
     208,247,240,186,165,189
3A   2120 DATA201,6,208,3,76,153,
     135,201,4,208,3
61   2130 DATA76,166,137,201,1,20
     8,13,169,0,141,173
14   2140 DATA2,169,8,141,174,2,7
     6,56,140,201,3
CC   2150 DATA208,13,169,255,141,
     173,2,169,8,141,174
8B   2160 DATA2,76,56,140,201,2,2
     08,8,169,8,141
70   2170 DATA174,2,76,74,140,201
     ,5,240,3,76,136
46   2180 DATA132,76,171,145,169,
     0,133,251,133,253,133
CE   2190 DATA247,133,249,169,4,1
     33,254,169,156,133,252
6D   2200 DATA169,152,133,248,169
     ,216,133,250,32,228,131
D1   2210 DATA120,162,0,189,8,129
     ,157,66,150,232,224
ED   2220 DATA19,208,245,169,192,
     32,144,255,169,0,133
9F   2230 DATA2,120,173,13,220,10
     4,168,104,170,104,64
29   2240 DATA66,12,15,1,4,32,32,
     225,66,19,1
A2   2250 DATA22,5,32,32,225,66,2
     2,5,18,9,6
DE   2260 DATA25,225,109,98,98,98
     ,98,98,98,254,169
5B   2270 DATA4,141,167,2,169,8,1
     41,168,2,169,14
56   2280 DATA141,169,2,162,133,1
     60,84,32,215,134,96
70   2290 DATA173,13,220,32,43,14
     0,32,202,131,32,116
00   2300 DATA133,32,38,131,173,0
     ,220,41,16,240,68
FF   2310 DATA165,189,205,170,2,2
     40,239,32,116,133,165
5B   2320 DATA189,208,3,76,22,133
     ,201,4,176,225,165
89   2330 DATA182,201,5,144,219,2
     01,13,176,215,165,189
76   2340 DATA141,170,2,56,233,1,
     10,24,105,14,170
B2   2350 DATA189,43,128,133,251,
     232,189,43,128,133,252
32   2360 DATA160,6,177,251,73,12
     8,145,251,136,208,247
17   2370 DATA240,178,165,189,201
     ,1,240,10,201,3,240
4D   2380 DATA19,201,2,240,28,208
     ,162,169,0,141,173
08   2390 DATA2,169,1,141,174,2,7
     6,56,140,169,255
D5   2400 DATA141,173,2,169,1,141
     ,174,2,76,56,140
BD   2410 DATA169,1,141,174,2,76,
     74,140,66,3,15
EC   2420 DATA14,20,18,15,12,32,1
     6,46,225,66,4
E4   2430 DATA5,19,11,32,9,14,6,1
     5,32,225,66
63   2440 DATA5,24,9,20,32,32,32,
     32,32,32,225
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5A   2450 DATA109,98,98,98,98,98,
     98,98,98,98,98
D7   2460 DATA254,169,4,141,167,2
     ,169,12,141,168,2
F8   2470 DATA169,22,141,169,2,16
     2,134,160,23,32,215
C9   2480 DATA134,96,173,13,220,3
     2,43,140,32,202,131
FB   2490 DATA32,71,134,32,38,131
     ,173,0,220,41,16
D0   2500 DATA240,68,165,189,205,
     170,2,240,239,32,71
B6   2510 DATA134,165,189,208,3,7
     6,22,133,201,4,176
24   2520 DATA225,165,182,201,10,
     144,219,201,22,176,215
45   2530 DATA165,189,141,170,2,5
     6,233,1,10,24,105
56   2540 DATA22,170,189,43,128,1
     33,251,232,189,43,128
B4   2550 DATA133,252,160,10,177,
     251,73,128,145,251,136
D1   2560 DATA208,247,240,178,165
     ,189,201,2,208,3,76
C4   2570 DATA192,136,201,1,208,3
     ,76,100,143,201,3
F2   2580 DATA208,158,104,104,104
     ,169,0,141,4,128,76
7E   2590 DATA102,254,134,254,136
     ,132,253,174,167,2,172
93   2600 DATA169,2,24,185,43,128
     ,133,251,198,251,133
82   2610 DATA249,198,249,200,185
     ,43,128,133,252,105,212
24   2620 DATA133,250,172,168,2,1
     77,253,145,251,173,134
EC   2630 DATA2,145,249,136,208,2
     44,238,169,2,238,169
E0   2640 DATA2,24,173,168,2,101,
     253,133,253,144,3
14   2650 DATA24,230,254,202,208,
     194,96,112,64,64,64
8F   2660 DATA64,64,64,64,64,64,6
     4,64,64,64,64
43   2670 DATA64,64,64,64,64,64,6
     4,110,66,32,32
A8   2680 DATA32,32,32,32,32,32,3
     2,32,32,32,32
95   2690 DATA32,32,32,32,32,32,3
     2,32,225,66,32
14   2700 DATA32,32.32,32,32,32.3
14   2700 DATA32,32,32,32,32,32,3
     2,32,32,32,32
AD   2710 DATA32,32,32,32,32,32,3
     2,32,32,225,109
A4   2720 DATA98,98,98,98,98,98,9
     8,98,98,98,98
BA   2730 DATA98,98,98,98,98,98,9
     8,98,98,98,254
85   2740 DATA3,15,13,13,1,14,4,5
     8,169,4,141
F9   2750 DATA167,2,169,23,141,16
     8,2,169,86,141,169
CE   2760 DATA2,162,135,160,30,32
     ,215,134,96,32,130
6A   2770 DATA135,162,0,189,122,1
     35,157,6,7,232,224
5E   2780 DATA8,208,245,162,1,169
     ,160,157,45,7,138
EA   2790 DATA72,32,228,255,240,2
     51,168,104,170,152,201
EA   2800 DATA20,208,10,169,32,15
     7,45,7,202,240,226
18   2810 DATA208,226,157,103,150
     ,201,13,240,12,41,63
AA   2820 DATA157,45,7,232,224,22
     ,208,209,169,13,157
EE   2830 DATA103,150,169,15,162,
     8,160,15,32,186,255
EF   2840 DATA169,0,32,189,255,32
     ,192,255,144,3,76
B8   2850 DATA70,141,162,15,32,20
     1,255,144,3,76,70
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59 2860 DATA141,162,1,189,103,150,32,210,255,201,13
E2 2870 DATA240,4,232,76,1,136,32,204,255,169,15
BF 2880 DATA32,195,255,76,166,137,112,64,64,110,66
F1 2890 DATA15,11,225,109,98,98,254,169,3,141,167
ED 2900 DATA2,169,4,141,168,2,169,112,141,169,2
F4 2910 DATA162,136,160,26,32,215,134,96,32,38,136
2D 2920 DATA173,0,220,41,16,208,249,32,38,131,165
86 2930 DATA189,201,15,208,240,165,182,201,18,144,234
48 2940 DATA201,20,176,230,76,22,133,112,64,64,64
96 2950 DATA64,64,64,64,64,64,110,66,32,32,11
EE 2960 DATA5,18,14,1,12,32,225,66,32,32,32
EE 2970 DATA32,9,9,32,32,32,225,66,32,32,32
28 2980 DATA32,32,32,32,32,32,225,66,32,23,18
F8 2990 DATA9,20,20,5,14,32,225,66,32,32,32
9D 3000 DATA32,2,25,32,32,32,225,66,32,16,1
94 3010 DATA20,18,9,3,11,32,225,66,32,32,3
DC 3020 DATA8,1,2,12,5,32,225,109,98,98,98
DE 3030 DATA98,98,98,98,98,98,254,169,9,141,167
38 3040 DATA2,169,11,141,168,2,169,94,141,169,2
DF 3050 DATA162,136,160,93,32,215,134,76,61,136,112
FE 3060 DATA64,64,64,64,64,64,64,64,64,64,64
C8 3070 DATA64,64,64,64,64,64,64,64,64,64,64
7F 3080 DATA64,64,110,66,4,9,19,11,32,19,20
24 3090 DATA1,20,21,19,58,32,32,32,32,32,32
64 3100 DATA32,32,32,32,32,32,225,66,14,15,32
23 3110 DATA20,18,1,3,11,32,19,5,3,20,15
02 3120 DATA18,32,32,32,32,32,32,32,32,32,225
B1 3130 DATA66,32,32,32,32,32,32,32,32,32,32
26 3140 DATA32,32,32,32,32,32,32,32,32,32,32
3C 3150 DATA32,32,32,225,66,20,5,24,20,58,32
D2 3160 DATA32,32,32,32,32,32,32,32,32,32,32
8B 3170 DATA32,32,32,32,32,32,225,66,32,32
7E 3180 DATA32,32,32,32,32,32,32,32,32,32,32
A8 3190 DATA32,32,32,32,32,32,32,32,32,32,32
F3 3200 DATA225,109,98,98,98,98,98,98,98,98,98
78 3210 DATA98,98,98,98,98,98,98,98,98,98,98
05 3220 DATA98,98,98,98,254,169,7,141,167,2,169
39 3230 DATA26,141,168,2,169,44,141,169,2,162,136
E6 3240 DATA160,217,32,215,134,96,32,143,137,169,15
3C 3250 DATA162,8,160,15,32,186,255,169,0,32,189
47 3260 DATA255,32,192,255,144,3,76,70,141,162,15
80 3270 DATA32,198,255,144,3,76,70,141,162,0,32
DF 3280 DATA207,255,72,32,183,255,41,128,240,5,169
38 3290 DATA5,76,70,141,104,201,44,240,8,41,63
6E 3300 DATA157,110,5,232,208,227,162,0,32,207,255
C7 3310 DATA201,44,240,8,41,63,157,190,5,232,208
B1 3320 DATA241,162,0,32,207,255,201,44,240,8,41
37 3330 DATA63,157,113,5,232,208,241,162,6,32,207
41 3340 DATA255,201,13,240,8,41,63,157,113,5,232
33 3350 DATA208,241,169,15,32,195,255,32,204,255,76
FE 3360 DATA61,136,6,9,12,5,32,14,1,13,5
A0 3370 DATA58,32,130,135,162,0,189,38,138,157,6
84 3380 DATA7,232,224,10,208,245,162,1,169,160,157
90 3390 DATA45,7,138,72,32,228,255,240,251,168,104
EA 3400 DATA170,152,201,20,208,10,169,32,157,45,7
10 3410 DATA202,240,226,208,226,157,103,150,201,13,240
5C 3420 DATA10,41,63,157,45,7,232,224,17,208,209
49 3430 DATA173,174,2,201,1,240,4,224,2,144,180
F4 3440 DATA142,172,2,96,112,64,64,64,64,64,64
B9 3450 DATA64,64,64,64,110,66,1,4,4,18,5
3C 3460 DATA19,19,58,32,32,225,66,2,1,19,9
D9 3470 DATA3,32,32,32,32,32,225,66,5,12,19
F2 3480 DATA5,32,32,32,32,32,32,225,66,19,20
51 3490 DATA1,18,20,58,32,32,32,32,225,66,5
8D 3500 DATA14,4,58,32,32,32,32,32,32,225,109
1B 3510 DATA98,98,98,98,98,98,98,98,98,98,254
A5 3520 DATA169,7,141,167,2,169,12,141,168,2,169
19 3530 DATA30,141,169,2,162,138,160,128,32,215,134
CE 3540 DATA96,32,212,138,32,38,131,173,0,220,41
4C 3550 DATA16,240,67,165,189,205,170,2,240,239,32
0F 3560 DATA212,138,165,189,201,7,144,230,201,9,176
A3 3570 DATA226,165,182,201,21,144,220,201,27,176,216
7F 3580 DATA165,189,141,170,2,56,233,5,10,24,105
76 3590 DATA30,170,189,43,128,133,251,232,189,43,128
2F 3600 DATA133,252,160,5,177,251,73,128,145,251,136
0B 3610 DATA208,247,240,179,96,169,1,174,174,2,172
53 3620 DATA167,2,32,186,255,173,172,2,162,104,160
33 3630 DATA150,32,189,255,173,173,2,174,253,3,172
75 3640 DATA252,3,32,213,255,144,3,76,70,141,32
25 3650 DATA123,141,173,167,2,240,4,134,45,132,46
AB 3660 DATA173,174,2,201,1,240,3,76,166,137,76
0B 3670 DATA61,136,169,5,133,254,169,130,133,253,32
F6 3680 DATA168,139,32,211,139,173,254,3,48,237,169
34 3690 DATA0,141,167,2,76,60,139,165,43,141,253
87 3700 DATA3,165,44,141,252,3,169,1,141,167,2
7B 3710 DATA76,60,139,160,1,169,160,145,253,152,72
47 3720 DATA32,228,255,240,251,170,104,168,138,201,20
AD 3730 DATA208,9,169,32,145,253,136,240,228,208,228
98 3740 DATA153,251,3,41,63,145,253,200,192,5,208
68 3750 DATA216,96,162,0,160,0,189,252,3,201,48
D2 3760 DATA144,71,201,58,176,14,56,233,48,157,252
2D 3770 DATA3,232,224,4,208,234,76,3,140,201,65
80 3780 DATA144,49,201,71,176,45,56,233,55,157,252
B2 3790 DATA3,232,224,4,208,212,24,173,252,3,10
A8 3800 DATA10,10,10,109,253,3,141,252,3,24,173
1A 3810 DATA254,3,10,10,10,10,109,255,3,141,253
A1 3820 DATA3,169,0,141,254,3,96,169,128,141,254
8B 3830 DATA3,96,173,0,220,41,16,240,249,169,0
85 3840 DATA141,170,2,96,32,48,138,32,235,138,165
27 3850 DATA189,201,7,240,3,76,123,139,76,150,139
66 3860 DATA32,48,138,32,235,138,165,189,201,7,240
A1 3870 DATA3,76,139,140,76,202,140,169,1,174,174
88 3880 DATA2,160,0,32,186,255,173,172,2,162,104
42 3890 DATA160,150,32,189,255,166,174,164,175,169,193
BD 3900 DATA32,216,255,144,3,76,70,141,173,174,2
86 3910 DATA201,1,240,3,76,166,137,76,61,136,169
76 3920 DATA5,133,254,169,130,133,253,32,168,139,32
A1 3930 DATA211,139,173,254,3,48,237,173,253,3,133
14 3940 DATA193,173,252,3,133,194,169,5,133,254,169
BD 3950 DATA168,133,253,32,168,139,32,211,139,173,254
76 3960 DATA3,48,237,173,253,3,133,174,230,174,173
B4 3970 DATA252,3,133,175,76,92,140,165,43,133,193
BC 3980 DATA165,44,133,194,165,45,133,174,230,174,165
C7 3990 DATA46,133,175,76,92,140,112,64,64,64,64
CE 4000 DATA64,64,64,64,64,64,64,64,64,64,64
CB 4010 DATA64,64,64,110,66,32,9,47,15,32,5
E8 4020 DATA18,18,15,18,58,32,32,32,32,32,32
D6 4030 DATA32,225,66,32,32,32,32,32,32,32,32
DD 4040 DATA32,32,32,32,32,32,32,32,32,32,225
3C 4050 DATA109,98,98,98,98,98,98,98,98,98,98
37 4060 DATA98,98,98,98,98,98,98,98,254,169,4
D5 4070 DATA141,167,2,169,20,141,168,2,169,118,141
6B 4080 DATA169,2,162,140,160,223,32,215,134,96,72
5A 4090 DATA32,47,141,104,56,233,1,10,170,189,40
4A 4100 DATA163,133,251,232,189
```

```
      ,40,163,133,252,160,0
50    4110 DATA177,251,48,8,41,63,
      153,212,6,200,208
20    4120 DATA244,41,63,153,212,6
      ,169,1,32,195,255
C9    4130 DATA169,15,32,195,255,7
      6,61,136,173,173,2
B6    4140 DATA240,17,162,28,32,18
      3,255,41,16,208,1
63    4150 DATA96,104,104,169,28,7
      6,70,141,32,183,255
08    4160 DATA41,191,208,1,96,104
      ,104,169,29,76,70
AF    4170 DATA141,165,203,201,4,2
      40,1,96,104,104,169
78    4180 DATA255,141,88,150,169,
      141,72,169,184,72,169
BB    4190 DATA32,72,64,173,13,220
      ,165,203,201,5,208
34    4200 DATA250,169,0,141,88,15
      0,104,168,104,170,104
B3    4210 DATA64,32,202,241,32,78
      ,131,96,112,64,64
3D    4220 DATA64,64,64,64,64,64,6
      4,64,64,64,64
6F    4230 DATA64,64,64,64,64,110,
      66,2,1,3,11
0E    4240 DATA7,18,15,21,14,4,32,
      3,15,12,15
AD    4250 DATA18,32,32,225,66,32,
      160,160,160,160,160
F4    4260 DATA160,160,160,160,160
      ,160,160,160,160,160,160
1F    4270 DATA32,225,66,32,32,32,
      32,32,32,32,32
1E    4280 DATA32,32,32,32,32,32,3
      2,32,32,32,225
8D    4290 DATA66,32,32,32,32,32,3
      2,32,32,32,32
96    4300 DATA32,32,32,32,32,32,3
      2,32,225,66,6
21    4310 DATA15,18,5,7,18,15,21,
      14,4,32,3
51    4320 DATA15,12,15,18,32,32,2
      25,66,32,160,160
B2    4330 DATA160,160,160,160,160
      ,160,160,160,160,160,160
41    4340 DATA160,160,160,32,225,
      66,32,32,32,32,32
DC    4350 DATA32,32,32,32,32,32,3
      2,32,32,32,32
16    4360 DATA32,32,225,66,32,32,
      32,32,32,32,32
BD    4370 DATA32,32,32,32,32,32,3
      2,32,32,32,32
B3    4380 DATA225,66,3,21,18,19,1
      5,18,32,3,15
BF    4390 DATA12,15,18,32,32,32,3
      2,32,32,225,66
7B    4400 DATA32,160,160,160,160,
      160,160,160,160,160,160
06    4410 DATA160,160,160,160,160
      ,160,32,225,66,32,32
2F    4420 DATA32,32,32,32,32,32,3
      2,32,32,32,32
BE    4430 DATA32,32,32,32,32,225,
      66,32,32,85,67
84    4440 DATA67,67,67,67,67,67,7
      3,32,85,67,67
7F    4450 DATA73,32,32,225,66,32,
      32,66,18,5,19
F8    4460 DATA20,15,18,5,66,32,66
      ,15,11,66,32
54    4470 DATA32,225,66,32,32,74,
      67,67,67,67,67
FF    4480 DATA67,67,75,32,74,67,6
      7,75,32,32,225
5A    4490 DATA109,98,98,98,98,98,
      98,98,98,98,98
28    4500 DATA98,98,98,98,98,98,9
      8,98,254,169,16
DE    4510 DATA141,167,2,169,20,14
      1,168,2,169,126,141
C2    4520 DATA169,2,162,141,160,2
      11,32,215,134,173,33
B7    4530 DATA208,41,15,168,169,3
      0,153,35,5,173,32
AF    4540 DATA208,41,15,168,169,3
      0,153,195,5,173,134
9B    4550 DATA2,41,15,168,169,30,
      153,99,6,160,15
12    4560 DATA152,153,251,216,153
      ,155,217,153,59,218,136
5C    4570 DATA208,243,152,153,251
      ,216,153,155,217,153,59
26    4580 DATA218,96,32,19,143,17
      3,0,220,41,16,208
5F    4590 DATA249,32,38,131,165,1
      89,201,6,240,63,201
3E    4600 DATA10,240,77,201,14,24
      0,91,201,17,208,228
85    4610 DATA165,182,201,13,144,
      222,201,20,144,35,201
A4    4620 DATA23,144,214,201,25,1
      76,210,173,32,208,41
D1    4630 DATA15,141,253,151,173,
      33,208,41,15,141,254
D3    4640 DATA151,173,134,2,41,15
      ,141,252,151,76,22
67    4650 DATA133,104,104,104,76,
      195,129,32,236,143,208
F5    4660 DATA3,76,103,143,165,18
      2,233,10,141,33,208
3B    4670 DATA76,100,143,32,236,1
      43,208,3,76,103,143
5D    4680 DATA165,182,233,10,141,
      32,208,76,100,143,32
CE    4690 DATA236,143,208,3,76,10
      3,143,165,182,233,10
98    4700 DATA141,134,2,76,100,14
      3,165,182,201,11,144
37    4710 DATA7,201,27,176,3,169,
      255,96,169,0,96
05    4720 DATA112,64,64,64,64,64,
      64,64,64,64,64
3D    4730 DATA64,64,64,64,64,64,6
      4,64,64,64,64
E3    4740 DATA64,64,64,64,64,110,
      66,32,32,32,32
56    4750 DATA32,32,32,32,32,32,3
      2,32,32,32,32
40    4760 DATA32,32,32,32,32,32,3
      2,32,32,32,32
3D    4770 DATA225,66,32,32,32,32,
      32,32,32,32,32
2C    4780 DATA32,32,32,32,32,32,3
      2,32,32,32,32
A5    4790 DATA32,32,32,32,32,32,2
      25,66,32,32,32
98    4800 DATA32,32,32,32,32,32,3
      2,32,32,32,32
9A    4810 DATA32,32,32,32,32,32,3
      2,32,32,32,32
E7    4820 DATA32,225,66,32,32,32,
      32,32,32,32,32
46    4830 DATA32,32,32,32,32,32,3
      2,32,32,32,32
E7    4840 DATA32,32,32,32,32,32,3
      2,225,66,32,32
F2    4850 DATA32,32,32,32,32,32,3
      2,32,32,32,32
DC    4860 DATA32,32,32,32,32,32,3
      2,32,32,32,32
16    4870 DATA32,32,225,66,32,32,
      32,32,32,32,32
BD    4880 DATA32,32,32,32,32,32,3
      2,32,32,32,32
E2    4890 DATA32,32,32,32,32,32,3
      2,32,225,66,32
89    4900 DATA32,32,32,32,32,32,3
      2,32,32,32,32
A3    4910 DATA32,32,32,32,32,32,3
      2,32,32,32,32
FC    4920 DATA32,32,32,225,66,32,
      32,32,32,32,32
2F    4930 DATA32,32,32,32,32,32,3
      2,32,32,32,32
08    4940 DATA32,32,32,32,32,32,3
      2,32,32,225,66
1B    4950 DATA32,32,32,32,32,32,3
      2,32,32,32,32
2D    4960 DATA32,32,32,32,32,32,3
      2,32,32,32,32
52    4970 DATA32,32,32,32,225,66,
      32,32,32,32,32
B9    4980 DATA32,32,32,32,32,32,3
      2,32,32,32,32
47    4990 DATA32,32,32,32,32,32,3
      2,32,32,32,225
62    5000 DATA66,32,32,32,32,32,3
      2,32,32,32,32
5F    5010 DATA32,32,32,32,32,32,3
      2,32,32,32,32
78    5020 DATA32,32,32,32,32,225,
      66,32,32,32,32
0B    5030 DATA32,32,32,32,32,32,3
      2,32,32,32,32
DD    5040 DATA32,32,32,32,32,32,3
      2,32,32,32,32
02    5050 DATA225,109,98,98,98,98
      ,98,98,98,98,98
4D    5060 DATA98,98,98,98,98,98,9
      8,98,98,98,98
AA    5070 DATA98,98,98,98,98,98,2
      54,36,76,69,68
27    5080 DATA81,69,83,71,82,80,8
      2,83,85,76,69
82    5090 DATA82,169,14,141,167,2
      ,169,28,141,168,2
F9    5100 DATA169,58,141,169,2,16
      2,143,160,252,32,215
CB    5110 DATA134,96,32,148,145,1
      69,1,162,8,160,1
41    5120 DATA32,186,255,169,1,16
      2,132,160,145,32,189
94    5130 DATA255,32,192,255,144,
      3,76,70,141,162,1
7A    5140 DATA32,198,255,144,3,76
      ,70,141,162,0,32
25    5150 DATA207,255,232,224,142
      ,208,248,160,0,32,207
4F    5160 DATA255,41,63,73,128,15
      3,173,4,200,232,192
67    5170 DATA26,208,240,32,207,2
      55,232,224,254,208,248
4B    5180 DATA169,0,133,247,32,20
      7,255,56,233,128,176
B9    5190 DATA2,169,0,133,248,10,
      101,248,170,160,3
5E    5200 DATA189,133,145,41,63,1
      53,101,6,232,136,192
83    5210 DATA0,208,242,32,207,25
      5,32,207,255,162,3
16    5220 DATA32,207,255,41,63,15
      7,106,6,232,224,19
97    5230 DATA208,243,32,207,255,
      232,224,30,208,248,32
AE    5240 DATA183,255,41,64,240,1
      4,169,1,32,195,255
63    5250 DATA32,204,255,32,166,1
      46,76,61,136,32,225
11    5260 DATA255,240,237,32,104,
      146,32,166,146,230,247
4A    5270 DATA165,247,201,8,240,1
      51,32,207,255,32,207
1B    5280 DATA255,76,250,145,169,
      59,141,169,2,174,169
76    5290 DATA2,189,43,128,133,25
      1,232,189,43,128,133
47    5300 DATA252,232,189,43,128,
      133,253,232,189,43,128
4A    5310 DATA133,254,160,26,177,
      253,145,251,136,208,249
92    5320 DATA165,253,133,251,165
      ,254,133,252,173,169,2
B8    5330 DATA105,2,141,169,2,56,
      201,83,144,200,96
E5    5340 DATA160,26,169,32,153,1
      00,6,136,208,250,96
```

NUMBER TUMBLE

Please refer to Listings before typing in any programs.

```
PROGRAM: NUMBER TUMBLE 1
```

```
8B  10 POKE53280,8:POKE53281,8
AC  12 PRINT"[CLR,DOWN7]"TAB(15)
    "[BLACK]PLEASE WAIT"
B6  14 PRINTTAB(10)"[DOWN]DO NOT
     STOP THE TAPE"
2A  16 FORX=0TO35:READA:POKE5000
    0+X,A:NEXT
64  18 POKE56334,PEEK(56334)AND2
    54:POKE1,PEEK(1)AND251:SYS50
    000
62  19 POKE50001,96:SYS50000
E1  20 POKE1,PEEK(1)OR4:POKE5633
    4,PEEK(56334)OR1
A5  22 FORX=0TO159:READA:POKE210
    00+X,A:NEXT
B0  24 FORX=0TO50:READA:POKE5100
    0+X,A:NEXT
0B  26 FORX=0TO50:READA:POKE5110
    0+X,A:NEXT
84  28 FORX=0TO145:READA:POKE520
    00+X,A:NEXT
93  30 FORX=0TO255:READA:POKE256
    00+X,255-A:NEXT
4A  32 POKE198,3:POKE631,13:POKE
    632,13:POKE633,13
9C  34 PRINT"[CLR,DOWN2]LOAD":PR
    INT"[DOWN6]RUN[HOME]";
65  100 REM M/C DATA TRANSFER
67  102 DATA169,80,133,252,169,2
    08,133,254
9F  104 DATA169,0,133,251,133,25
    3,168,177
F1  106 DATA253,145,251,230,251,
    230,253
84  108 DATA208,246,230,252,230,
    254,166
82  110 DATA254,224,224,208,236,
    96
4A  112 :
57  114 REM   UDG CHARACTERS
7B  116 REM   NO.1
C4  118 DATA7,31,62,126,126,252,
    248,254
4A  120 DATA224,248,60,62,62,63,
    63,63
A5  122 DATA254,254,254,126,112,
    56,31,7
1D  124 DATA63,63,63,62,6,12,248
    ,224
72  126 REM   NO.2
02  128 DATA7,31,56,120,113,243,
    255,255
1D  130 DATA224,248,28,14,198,23
    1,199,15
75  132 DATA254,252,248,113,112,
    48,31,7
56  134 DATA31,127,255,254,14,12
    ,248,224
C9  136 REM   NO.3
3B  138 DATA7,31,56,120,113,243,
    255,254
1F  140 DATA224,248,28,14,198,22
    7,227,7
F9  142 DATA254,255,243,113,120,
    56,31,7
A2  144 DATA7,227,227,198,6,28,2
    48,224
20  146 REM   NO.4
8D  148 DATA7,31,63,126,124,248,
    241,227
DD  150 DATA224,248,28,30,30,31,
    31,31
97  152 DATA192,192,255,127,127,
    63,31,7
F3  154 DATA3,3,31,30,30,28,248,
    224
17  156 REM   NO.5
36  158 DATA7,31,48,112,113,241,
    240,240
75  160 DATA224,248,12,14,254,25
    5,63,31
76  162 DATA255,255,241,113,120,
    56,31,7
43  164 DATA143,143,143,142,14,2
    8,248,224
41  166 REM M/C NUMBERS UP
08  168 DATA162,19,160,40,177,25
    1,72,177,253,160,0,145,253,1
    04,145,251
4F  170 DATA160,41,177,251,72,17
    7,253,160,1,145,253,104,145,
    251,202,240,17
A8  172 DATA24,165,251,105,40,13
    3,251,133,253,144,214,230,25
    2,230,254,208,208,96
8E  174 REM M/C NUMBERS DOWN
80  176 DATA162,19,160,0,177,251
    ,72,177,253,160,40,145,253,1
    04,145,251
87  178 DATA160,1,177,251,72,177
    ,253,160,41,145,253,104,145,
    251,202,240,17
9E  180 DATA56,165,251,233,40,13
    3,251,133,253,176,214,198,25
    2,198,254,208,208,96
A1  182 REM M/C SOUND
AA  184 DATA120,169,45,141,20,3,
    169,203,141,21,3,88,96,160,0
    ,165,195,240,60
2B  186 DATA165,196,208,33,177,1
    76,141,0,212,230,176,177,176
    ,141,1,212,201,18,208,6
39  188 DATA169,30,133,196,208,4
    ,169,8,133,196,169,65,141,4,
    212,208,27,198,196
86  190 DATA208,23,230,176,169,6
    4,141,4,212,230,195,165,195,
    201,31,208,8,169,0
BF  192 DATA133,195,169,118,133,
    176,76,49,234
E7  194 DATA96,22,49,28,30,25,16
    5,31,49,28,135,33,96,22,49,2
    8
CA  195 DATA31,21,30,25,96,22,49
    ,28,31,21,30,25,209,18
0A  196 DATA49,28,135,33,30,25,1
    65,31,96,22,49,28,135,33,62,
    42
9C  197 DATA49,28,135,33,30,25,1
    65,31,96,22,49,28,209,18
27  198 REM   N
E7  200 DATA0,60,60,62,63,63,63,
    63
7E  202 DATA0,60,60,60,60,188,25
    2,252
A4  204 DATA61,60,60,60,60,60,60
    ,0
04  206 DATA252,252,124,60,60,60
    ,60,0
2A  208 REM   U
3B  210 DATA0,60,60,60,60,60,60,
    60
85  212 DATA0,60,60,60,60,60,60,
    60
B1  214 DATA60,60,60,63,63,31,15
    ,0
D7  216 DATA60,60,60,252,252,248
    ,240,0
38  218 REM   M
14  220 DATA0,112,120,124,126,12
    7,127,123
74  222 DATA0,14,30,62,126,254,2
    54,222
24  224 DATA120,120,120,120,120,
    120,120,0
3D  226 DATA158,30,30,30,30,30,3
    0,0
89  228 REM   B
90  230 DATA0,63,63,63,60,60,63,
    63
DD  232 DATA0,224,240,240,56,56,
    248,240
25  234 DATA63,60,60,60,63,63,63
    ,0
B1  236 DATA240,56,28,28,252,248
    ,240,0
84  238 REM   E
96  240 DATA0,63,63,63,60,60,63,
    63
94  242 DATA0,252,252,252,0,0,22
    4,224
03  244 DATA63,60,60,60,63,63,63
    ,0
84  246 DATA224,0,0,0,252,252,25
    2,0
85  248 REM   R
47  250 DATA0,63,63,63,60,60,60,
    63
A3  252 DATA0,224,240,248,60,28,
    60,248
A8  254 DATA63,63,63,60,60,60,60
    ,0
4F  256 DATA240,192,224,240,120,
    60,28,0
F8  258 REM   T
27  260 DATA0,63,63,63,63,3,3,3
BE  262 DATA0,252,252,252,252,19
    2,192,192
2B  264 DATA3,3,3,3,3,3,3,0
BA  266 DATA192,192,192,192,192,
    192,192,0
EE  268 REM   L
CE  270 DATA0,60,60,60,60,60,60,
    60
3E  272 DATA0,0,0,0,0,0,0,0
52  274 DATA60,60,60,63,63,63,63
    ,0
AA  276 DATA0,0,0,252,252,252,25
    2,0
```

If using disk change line 34 in NUMBLER TUMBLER 1 to:

34 PRINT "(CLEAR)(DOWN)(DOWN)LOA D"+CHR$(34)+"NUMBER TUMBLE 2"+CH R$(34)+",8":PRIN T"(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)RUN(HOME)":

```
PROGRAM: NUMBER TUMBLE 2
```

```
65  98 FORX=1TO5:JX(X)=2:JX(X+5)
    =22:NEXT:JY(1)=3:JY(6)=3:JY(
    2)=7:JY(7)=7:JY(3)=11
B6  99 JY(8)=11:JY(4)=15:JY(9)=1
    5:JY(5)=19:JY(10)=19:V=54272

CC  100 DIMG%(25),R%(25),T%(25)
E3  101 B$="[RIGHT2,UP]":C$="[DO
    WN23]":D$="[RIGHT25]"
0F  102 A1$="[BLUE,SA,SB,DOWN,LE
    FT2,SC,SD]":A2$="[GREEN,SE,S
    F,DOWN,LEFT2,SG,SH]":A3$="[P
    URPLE,SI,SJ,DOWN,LEFT2,SK,SL
    ]"
84  104 A4$="[RED,SM,SN,DOWN,LEF
    T2,SO,SP]":A5$="[WHITE,SQ,SR
    ,DOWN,LEFT2,SS,ST]"
```

```
AB  105 E$="[CD,CF,DOWN,LEFT2,C*
    ,S£]":F$="[RVSON,S£,C*,DOWN,
    LEFT2,RVSOFF,CC,CV]":G$="[CD
    ,RVSON,C*,DOWN,LEFT2,RVSOFF,
    CC,S£]":H$="[RVSON,S£,RVSOFF
    ,CF,DOWN,LEFT2,C*,CV]"
C7  106 DEFFNA(X)=2+(((X-1)/5)*4
    ):DEFFNB(Y)=3+((CT-Y)*4)
F0  110 POKEV+12,0:POKEV+13,249:
    POKEV+7,97
63  115 T1$="[SN,RVSON,C6,S£] [R
    VSOFF,S£,BLACK,RVSON,S£,RVSO
    FF]":T2$="[RVSON,C*,C6,RVSOF
    F,C*,RVSON] [C*,RVSOFF,BLACK
    ,SM]":T3$="[BLACK,SO,CY3,RVS
    ON] [RVSOFF]":T4$="[BLACK,RV
    SON] [RVSOFF,CY3,SP]"
9D  116 T5$="[BLACK,SL,CP3,S£]":
    T6$="[BLACK,C*,CP3,S@]"
AE  117 Z1$="[C7,RVSON]@A[DOWN,L
    EFT2]BC[RVSOFF]":Z2$="[GREEN
    ,RVSON]DE[DOWN,LEFT2]FG[RVSO
    FF]":Z3$="[PURPLE,RVSON]HI[D
    OWN,LEFT2]JK[RVSOFF]":Z4$="[
    C1,RVSON]LM[DOWN,LEFT2]NO[RV
    SOFF]"
30  118 Z5$="[C3,RVSON]PQ[DOWN,L
    EFT2]RS[RVSOFF]":Z6$="[C5,RV
    SON]TU[DOWN,LEFT2]VW[RVSOFF]
    ":Z7$="[C7,RVSON]XY[DOWN,LEF
    T2]Z[[RVSOFF]":Z8$="[C5,RVSO
    N]£][DOWN,LEFT2]^←[RVSOFF]"
79  131 SYS52000:POKE195,0:POKE1
    96,0
F4  132 POKEV+5,10:POKEV+6,17:PO
    KEV+3,7:POKEV+2,0:POKEV+24,5
    :POKE176,118:POKE177,203
21  138 POKE56578,PEEK(56578)OR3
ED  140 POKE56576,(PEEK(56576)AN
    D252)OR2
DE  141 POKE648,68
79  142 GOSUB4600:PRINT"[CLR]"
A5  143 POKE53280,10:POKE53281,0
AA  144 :
2D  145 REM ***** MAIN LOOP ****
    **
A8  146 :
AD  150 GOSUB200
96  152 GOSUB1000
9D  154 GOSUB1500
BB  155 IFKE=3THENKE=0:GOTO150
94  156 GOSUB2010
F4  157 PY=1:GOSUB3500
35  158 IFWIN=0THENGOSUB600
AD  159 IFWIN<>0THENSC=100:GOSUB
    450:GOSUB3960:GOTO500
E3  160 GOSUB2000:GOSUB2500
9D  161 IFKE=3THENKE=0:GOTO150
B3  162 GOSUB3010
19  163 PY=2:GOSUB3500
53  164 IFWIN=0THENGOSUB600
DF  165 IFWIN<>0THENSC=100:GOSUB
    450:GOSUB3960:GOTO500
DB  166 GOSUB3000:GOTO154
FF  197 :
E1  198 REM ***** INPUT INFORMAT
    ION *****
FD  199 :
A2  200 PRINT"[CLR]";:PL=0:PL$="
    ":S1=0:S2=0:TEST=0
18  205 POKE53283,130:POKE53280,
    0
E8  210 POKE53265,PEEK(53265)OR6
    4
35  215 PRINTLEFT$(C$,4);
D7  220 FORX=0TO7:PRINTLEFT$(D$,
    2);"[RVSON,SPC18]"
63  225 NEXT
76  230 PRINT"[HOME]";LEFT$(C$,5
    );LEFT$(D$,3)"[YELLOW,RVSON]
    1 OR 2 PLAYERS ?"
68  235 PRINT"[RVSON,DOWN2,RIGHT
    5]";:PRINT"ENTER...[WHITE]";
    :FORX=0TO10:GETJUNK$:NEXT
C8  237 GETN$:IFN$=""THEN237
A6  238 IFN$=CHR$(19)ORN$=CHR$(2
    0)ORN$=CHR$(147)THEN200
69  239 IFN$=CHR$(13)ANDPL>0ANDP
    L<3THEN250
46  240 IFN$=CHR$(13)THEN200
33  241 PRINTN$;:PL$=PL$+N$:PL=V
    AL(PL$)
1C  242 IFLEN(PL$)>1THEN200
D4  245 GOTO237
69  250 PRINT"[HOME]"LEFT$(C$,4)
    ;
50  255 FORX=0TO7:PRINTLEFT$(D$,
    23);"[RVSON,SPC17]";
87  260 NEXT
45  265 PRINT"[HOME]";LEFT$(C$,5
    );LEFT$(D$,24)"[YELLOW,RVSON
    ]PLAYER 1'S NAME"
A9  270 PRINT"[RVSON,DOWN2]"LEFT
    $(D$,24);:PRINT"ENTER[DOWN2,
    LEFT4]............[LEFT14,W
    HITE]";
2A  275 FORX=0TO10:GETJUNK$:NEXT
    :N1$=""
AE  280 GETN$:IFN$=""THEN280
9E  282 IFN$=CHR$(19)ORN$=CHR$(2
    0)ORN$=CHR$(147)THEN250
AB  284 IFN$=CHR$(13)ANDLEN(N1$)
    >0THEN300
1A  286 IFN$=CHR$(13)THEN250
09  288 N1$=N1$+N$:PRINTN$;
73  290 IFLEN(N1$)>14THEN250
1B  295 GOTO280
90  300 IFPL=1THENN2$="COMMODORE
     64":GOTO350
8D  305 PRINT"[HOME]";LEFT$(C$,1
    4);
88  310 FORX=0TO7:PRINTLEFT$(D$,
    23);"[RVSON,SPC17]";
BE  315 NEXT
EC  320 PRINT"[HOME]";LEFT$(C$,1
    5);LEFT$(D$,24)"[YELLOW,RVSO
    N]PLAYER 2'S NAME"
8E  325 PRINT"[RVSON,DOWN2]"LEFT
    $(D$,24);:PRINT"ENTER[DOWN2,
    LEFT4]............[LEFT14,W
    HITE]";
2C  330 FORX=0TO10:GETJUNK$:NEXT
    :N2$=""
98  335 GETN$:IFN$=""THEN335
BF  340 IFN$=CHR$(19)ORN$=CHR$(2
    0)ORN$=CHR$(147)THEN305
E4  342 IFN$=CHR$(13)ANDLEN(N2$)
    >0THEN399
EF  344 IFN$=CHR$(13)THEN305
45  346 N2$=N2$+N$:PRINTN$;
83  348 IFLEN(N2$)>14THEN305
6E  349 GOTO335
F0  350 PRINT"[HOME]";LEFT$(C$,1
    4);
5F  355 FORX=0TO7:PRINTLEFT$(D$,
    2);"[RVSON,SPC18]"
EB  360 NEXT
17  365 PRINT"[HOME]";LEFT$(C$,1
    5);LEFT$(D$,4)"[YELLOW,RVSON
    ]LEVEL 1 - 5 ?"
64  366 PRINTLEFT$(D$,3)"[RVSON,
    DOWN]1-EASY[SPC4]5-HARD"
60  370 PRINT"[RVSON,DOWN2,RIGHT
    5]";:PRINT"ENTER...[WHITE]";
    :FORX=0TO10:GETJUNK$:NEXT:L$
    ="":L=0
14  375 GETN$:IFN$=""THEN375
87  380 IFN$=CHR$(19)ORN$=CHR$(2
    0)ORN$=CHR$(147)THEN350
47  385 IFN$=CHR$(13)ANDL>0ANDL<
    6THEN399
21  390 IFN$=CHR$(13)THEN350
5E  395 PRINTN$;:L$=L$+N$:L=VAL(
    L$)
AC  397 IFLEN(L$)>1THEN350
43  398 GOTO375
13  399 POKE53265,PEEK(53265)AND
    191:PRINT"[RVSOFF]":RETURN
FA  447 :
E0  448 REM ***** WIN SEQUENCES
    *****
F8  449 :
20  450 ONWINGOTO452,454,460,470
FC  452 GOSUB4000:PRINT"[YELLOW]
    ":GOSUB4008:RETURN
B3  454 GOSUB4050:PRINT"[YELLOW]
    ":GOSUB4060:RETURN
05  460 FORZ1=0TO5:FR=20+Z1*10:P
    OKEV+11,17
50  462 FORX=37TO0STEP-1:POKE562
    17+X,0:POKEV+8,FR+X:POKE5621
    7+X,8:NEXT
1E  464 NEXT:POKEV+11,0:RETURN
A3  470 FORZ1=0TO5:FR=20+Z1*10:P
    OKEV+11,17
4E  472 FORX=0TO37:POKE56217+X,0
    :POKEV+8,FR+(35-X):POKE56217
    +X,14:NEXT
C8  474 NEXT:POKEV+11,0:RETURN
CB  497 :
E0  498 REM ***** SCORE TABLE **
    ***
CE  499 :
29  500 PRINT"[CLR]":POKE53272,(
    PEEK(53272)AND240)OR8
62  501 SC=S1:SC$=N1$:GOSUB550
0D  502 SC=S2:SC$=N2$:GOSUB550
B5  504 PRINTTAB(7)Z1$"[UP]"Z2$"
    [UP]"Z3$"[UP]"Z4$"[UP]"Z5$"[
    UP]"Z6$"[UP]";
0B  506 PRINT"[RIGHT2]"Z7$"[UP]"
    Z2$"[UP]"Z3$"[UP]"Z4$"[UP]"Z
    8$"[UP]"Z5$"[DOWN]"
C1  508 PRINT"[DOWN2,YELLOW]"TAB
    (8)"NAME"TAB(28)"SCORE
67  510 FORX=1TO6
F7  512 PRINT"[DOWN,C7]"XTAB(5)S
    C$(X)TAB(28)SC(X):NEXT
9D  514 PRINT"[DOWN4]"TAB(7)"[WH
    ITE]PRESS F1 FOR ANOTHER GAM
    E"
54  515 TI$="000000"
5C  516 X=PEEK(197)
8A  517 IFTI$="000015"THENGOSUB4
    600:GOTO143
24  518 IFX<>4THEN516
9E  519 PRINT"[CLR]":POKE52072,1
    6:POKE53272,(PEEK(53272)AND2
    40)OR4:GOTO150
14  550 Y=7
B9  552 FORX=6TO1STEP-1
5A  554 IFSC>SC(X)THENSC(X+1)=SC
    (X):SC$(X+1)=SC$(X):Y=Y-1
AC  556 NEXT
88  558 SC(Y)=SC:SC$(Y)=SC$
BC  560 RETURN
6D  597 :
38  598 REM ***** POST 12345 TES
    T *****
63  599 :
6B  600 TEST=1:T=0:GOSUB3510
2B  602 IFWIN<>0THENTEST=0:GOSUB
    3500
56  604 TEST=0:RETURN
D2  997 :
2F  998 REM ***** SCREEN SET UP
    *****
D0  999 :
F1  1000 POKE53280,10
FD  1002 PRINT"[CLR,RVSON,C3]HOL
    D IN F7 FOR RESTART ":GOSUB1
    100
56  1003 Z=0
5D  1004 FORX=0TO4:PRINT"[HOME,D
```

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     OWN3,RIGHT4]";LEFT$(C$,X*4);
42   1006 FORY=0TO4:Z=Z+1
43   1008 Q=G%(Z)
43   1010 ONQGOSUB1051,1052,1053,
     1054,1055
3A   1012 NEXTY,X
8D   1013 IFS1<>S2THENRETURN
B8   1014 PRINT"[HOME,RVSON,C7,RI
     GHT]";LEFT$(C$,23)N1$;
C5   1016 N=LEN(N1$):FORZ=1TO18-N
     :PRINT" ";:NEXT:PRINT"[C*]";
0C   1018 N=LEN(N2$):PRINT"[C1,S£
     ]";:FORZ=1TO18-N:PRINT" ";:N
     EXT:PRINTN2$;"[RVSOFF]";
67   1019 IFPL=1THENPRINT"[HOME,C
     8]"LEFT$(C$,14)TAB(28)"LEVEL
     "L
71   1020 RETURN
46   1051 PRINTA1$;B$;:RETURN
D0   1052 PRINTA2$;B$;:RETURN
E2   1053 PRINTA3$;B$;:RETURN
D0   1054 PRINTA4$;B$;:RETURN
DE   1055 PRINTA5$;B$;:RETURN
8E   1100 FORX=0TO25:G%(X)=5:NEXT
     :
52   1102 FORX=1TO4:FORY=0TO4
5D   1104 N=INT(RND(0)*24)+1
12   1106 IFG%(N)<>5THENN=N+1:IFN
     =26THENN=1
B6   1108 IFG%(N)<>5THEN1106
DC   1110 G%(N)=X:NEXTY,X:RETURN
E4   1497 :
CF   1498 REM ***** PLAYER 1 TURN
      *****
DA   1499 :
F1   1500 JX=4:JY=1:JOY=0
79   1502 IFLEN(N1$)>9THEN1505
E2   1503 PRINT"[HOME,DOWN,C7]";L
     EFT$(D$,24);N1$;"'S TURN":GO
     TO1506
36   1505 PRINT"[HOME,DOWN,C7]";L
     EFT$(D$,24);N1$;"'S[DOWN,LEF
     T6]TURN"
1C   1506 PRINT"[YELLOW]":GOSUB16
     00:IFJOY=1THENPOKE195,1:GOTO
     1550
DB   1507 IFKE=3THENRETURN
84   1508 FORX=0TO200:NEXT
2E   1510 PRINT"[BLACK]":GOSUB160
     0
EC   1512 GOSUB1650
E4   1514 GOTO1506
67   1550 IFJY=1THEN1570
5D   1551 FORX=0TO3
8F   1552 POKE251,40+JX:POKE252,6
     8:POKE253,40+JX:POKE254,216
36   1554 P1=PEEK(17448+JX):P2=PE
     EK(17449+JX):P3=PEEK(55336+J
     X):P4=PEEK(55337+JX)
B8   1556 SYS51000
1A   1558 POKE18208+JX,P1:POKE182
     09+JX,P2:POKE56096+JX,P3:POK
     E56097+JX,P4
ED   1560 FORY=0TO300:NEXT
D5   1562 NEXT:GOTO1599
7A   1570 FORX=0TO3
12   1572 POKE251,72+JX:POKE252,7
     1:POKE253,72+JX:POKE254,219
B4   1574 P1=PEEK(18288+JX):P2=PE
     EK(18289+JX):P3=PEEK(56176+J
     X):P4=PEEK(56177+JX)
65   1576 SYS51100
74   1578 POKE17528+JX,P1:POKE175
     29+JX,P2:POKE55416+JX,P3:POK
     E55417+JX,P4
C9   1580 FORY=0TO300:NEXT
B6   1582 NEXT
CB   1599 RETURN
4F   1600 PRINT"[HOME]";LEFT$(C$,
     JY);LEFT$(D$,JX);:IFJY=1THEN
     PRINTE$:GOTO1604
33   1602 PRINTF$
C4   1604 RETURN
B9   1650 J=NOT(PEEK(56320))AND31
     :KE=PEEK(197)
1E   1652 IF(JAND1)=1OR(KE=9)THEN
     JY=1
79   1654 IF(JAND2)=2OR(KE=13)THE
     NJY=21
42   1656 IF(JAND4)=4OR(KE=34)THE
     NJX=JX-4:IFJX<4THENJX=4
D4   1658 IF(JAND8)=8OR(KE=42)THE
     NJX=JX+4:IFJX>20THENJX=20
FA   1660 IF(JAND16)=16OR(KE=60)T
     HENJOY=1
0A   1662 RETURN
EE   1997 :
F1   1998 REM ***** UPDATE TRUE G
     RID *****
EC   1999 :
9C   2000 PRINT"[HOME]":FORX=0TO8
     0:PRINT" ";:NEXT
32   2002 PRINT"[HOME]"LEFT$(C$,2
     1);:FORX=0TO30:PRINT" ";:NEX
     T:PRINT" "
F3   2004 FORX=0TO30:PRINT" ";:NE
     XT
52   2005 RETURN
55   2010 R=JX/4:IFJY=1THEN2018
C3   2012 FORX=RTO(R+15)STEP5
35   2014 R%(X)=G%(X+5):NEXT
DB   2016 R%(X)=G%(R):GOTO2024
69   2018 FORX=(R+5)TO(R+20)STEP5
AC   2020 R%(X)=G%(X-5):NEXT
04   2022 R%(R)=G%(X-5)
09   2024 FORX=RTOR+20STEP5:G%(X)
     =R%(X):NEXT
7F   2026 RETURN
5C   2397 :
2A   2398 REM ***** COMMODORE'S T
     URN *****
52   2399 :
18   2400 TEST=1:FORX=1TO25:T%(X)
     =G%(X):NEXT
6B   2402 Y=1:IFL=5THENY=0
A9   2404 FORX=1TO10:S(X)=Y:NEXT
95   2406 IFL=5THEN2412
81   2407 FORX=1TOL*2:Y=INT(RND(0
     )*10)+1
15   2408 Y=Y+1:IFY=11THENY=1
88   2410 IFS(Y)=0THEN2408
09   2411 S(Y)=0:NEXT
55   2412 T1=0:FORT=1TO10:IFS(T)=
     1THENNEXT:GOTO2422
70   2413 KE=PEEK(197):IFKE=3THEN
     T=10:NEXT:POKEV+24,5:RETURN
1F   2414 JX=JX(T):JY=JY(T):POKEV
     +24,15:POKEV+1,12
BE   2415 PRINT"[C1]":GOSUB2800:P
     OKEV+4,17
5D   2416 GOSUB3010:GOSUB3550:POK
     EV+4,0
72   2418 PRINT"[BLACK]":GOSUB280
     0:T1=T1+1
CB   2420 FORX=1TO25:G%(X)=T%(X):
     NEXTX,T
32   2422 PRINT"[C1]":GOSUB2810:P
     OKEV+4,17
B4   2424 FORT=1TO10:JX=JX(T):JY=
     JY(T)
40   2426 PRINT"[YELLOW]":GOSUB26
     00:GOSUB3010
62   2427 KE=PEEK(197):IFKE=3THEN

     T=10:NEXT:POKEV+24,5:RETURN
2F   2428 GOSUB3500:POKEV+4,0
0C   2429 IFWIN<>0THENJX=JX(T):JY
     =JY(T):T=10:NEXT:GOTO2439
91   2430 FORX=1TO25:G%(X)=T%(X):
     NEXT
E3   2432 PRINT"[BLACK]":GOSUB260
     0:NEXTT
DE   2434 MOVE=S(1):R%(0)=1:FORX=
     2TO10
BC   2436 IFS(X)>MOVETHENMOVE=S(X
     ):R%(0)=X
E8   2437 NEXT:R=R%(0)
35   2438 JX=JX(R):JY=JY(R)
1C   2439 FORX=1TO25:G%(X)=T%(X):
     NEXT
B3   2440 PRINT"[BLACK]":GOSUB281
     0:TEST=0:JOY=1:POKEV+24,5:RE
     TURN
F0   2497 :
1A   2498 REM ***** PLAYER 2 TURN
      *****
F6   2499 :
19   2500 JX=2:JY=3:JOY=0
45   2502 IFLEN(N2$)>9THEN2505
EF   2503 PRINT"[HOME,DOWN,C1]";L
     EFT$(D$,24);N2$;"'S TURN":GO
     TO2506
9C   2505 PRINT"[HOME,DOWN,C1]";L
     EFT$(D$,24);N2$;"'S[DOWN,LEF
     T6]TURN"
C1   2506 IFPL=1THENGOSUB2400
B7   2507 IFKE=3THENRETURN
40   2508 PRINT"[YELLOW]":GOSUB26
     00:IFJOY=1THENPOKE195,1:GOTO
     2550
E3   2509 FORX=0TO200:NEXT
4D   2510 PRINT"[BLACK]":GOSUB260
     0
D5   2512 GOSUB2650
D6   2514 GOTO2507
3D   2550 F=(JY-3)*40
06   2551 IFJX=22THEN2570
71   2552 FORX=0TO3
74   2554 P1=PEEK(17551+F):P2=PEE
     K(17591+F)
0A   2556 P3=PEEK(55439+F):P4=PEE
     K(55479+F)
38   2558 PRINT"[HOME,RIGHT4]"LEF
     T$(C$,JY)CHR$(148)CHR$(13)"[
     UP]"TAB(24)" "
6D   2560 PRINT"[RIGHT4]"CHR$(148
     )CHR$(13)"[UP]"TAB(24)" "
81   2562 POKE17532+F,P1:POKE1757
     2+F,P2
E3   2564 POKE55420+F,P3:POKE5546
     0+F,P4
27   2566 FORY=0TO300:NEXT
40   2568 NEXT:GOTO2599
5E   2570 FORX=0TO3
D7   2572 P1=PEEK(17530+F):P2=PEE
     K(17570+F)
D9   2574 P3=PEEK(55418+F):P4=PEE
     K(55458+F)
F4   2576 PRINT"[HOME]"LEFT$(C$,J
     Y)"[SPC3]"CHR$(20)TAB(21)CHR
     $(148)CHR$(13);
D2   2578 PRINT"[SPC3]"CHR$(20)CH
     R$(13)"[UP]"TAB(21)CHR$(148)
     CHR$(13)
CA   2580 POKE17549+F,P1:POKE5543
     7+F,P3
10   2582 POKE17589+F,P2:POKE5547
     7+F,P4
D9   2584 FORY=0TO300:NEXT
A6   2586 NEXT
BF   2599 RETURN
74   2600 PRINT"[HOME]";LEFT$(C$,
     JY);LEFT$(D$,JX);:IFJX=2THEN
     PRINTG$:GOTO2604
D1   2602 PRINTH$
B8   2604 RETURN
9D   2650 J=NOT(PEEK(56320))AND31
     :KE=PEEK(197)
90   2652 IF(JAND1)=1OR(KE=9)THEN
     JY=JY-4:IFJY<3THENJY=3
FA   2654 IF(JAND2)=2OR(KE=13)THE
     NJY=JY+4:IFJY>19THENJY=19
14   2656 IF(JAND4)=4OR(KE=34)THE
     NJX=2
D1   2658 IF(JAND8)=8OR(KE=42)THE
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     NJX=22
46   2660 IF(JAND16)=16OR(KE=60)T
     HENJOY=1
FE   2662 RETURN
CD   2797 :
86   2798 REM ***** THINKING MESS
     AGE *****
C3   2799 :
5B   2800 PRINT"[HOME]"LEFT$(C$,1
     6)
94   2802 PRINTTAB(26)"PLEASE WAI
     T"
86   2804 PRINTTAB(27)L*2-T1"TICK
     ";
FD   2805 IFL*2-T1>1THENPRINT"S"
8E   2806 RETURN
73   2810 PRINT"[HOME]"LEFT$(C$,1
     7)LEFT$(D$,27);
4B   2812 PRINT"I'M READY NOW"
86   2814 RETURN
FA   2997 :
9D   2998 REM ***** 2ND UPDATE TR
     UE GRID ***
F8   2999 :
88   3000 PRINT"[HOME]":FORX=0TO8
     0:PRINT" ";:NEXT
8F   3002 PRINT"[HOME]"
BD   3004 FORX=0TO20:PRINT"[SPC4]
     ";LEFT$(D$,18);"  ":NEXT
46   3005 RETURN
55   3010 R=((JY+1)/4)*5:IFJX=2TH
     EN3016
9B   3012 FORX=(R-4)TO(R-1):R%(X)
     =G%(X+1):NEXT
59   3014 R%(X)=G%(R-4):GOTO3022
86   3016 FORX=RTO(R-3)STEP-1
32   3018 R%(X)=G%(X-1):NEXT
AB   3020 R%(X)=G%(R)
AB   3022 FORX=(R-4)TOR:G%(X)=R%(
     X):NEXT
A6   3100 RETURN
8C   3497 :
67   3498 REM ***** SCORING COMBI
     NATIONS ***
82   3499 :
1B   3500 WIN=0
61   3502 FORX=1TO25:R%(X)=G%(X):
     NEXT
22   3510 FORX=1TO5:IFG%(X)=1THEN
     GOSUB3800
81   3512 NEXT:
AA   3513 IFWIN=2THENRETURN
23   3514 FORX=1TO5:IFG%(X)=5THEN
     GOSUB3810
4B   3516 NEXT
06   3517 IFWIN=2THENRETURN
2C   3518 FORX=1TO21STEP5:IFG%(X)
     =1THENGOSUB3820
4F   3520 NEXT
F3   3521 IFWIN=1THENRETURN
DD   3522 FORX=1TO21STEP5:IFG%(X)
     =5THENGOSUB3830
53   3524 NEXT
0F   3525 IFWIN=1THENRETURN
5C   3526 IFTEST=1THENRETURN
9A   3550 FORX=1TO21STEP5
4F   3552 CT=0:Y=0:P=G%(X):GOSUB3
     850
6D   3554 NEXT
40   3560 FORX=1TO5
62   3562 CT=0:Y=0:P=G%(X):GOSUB3
     860
26   3564 NEXT:IFTEST=1THENRETURN
83   3566 FORX=1TO25:G%(X)=R%(X):
     NEXT
F2   3568 GOSUB1003
71   3570 RETURN
50   3800 IFG%(X+5)<>2THENRETURN
7D   3802 IFG%(X+10)<>3THENRETURN
7D   3804 IFG%(X+15)<>4THENRETURN
6F   3806 IFG%(X+20)=5THENJY=1:JX
     =X*4:X=5:WIN=2:RETURN
60   3808 RETURN
DC   3810 IFG%(X+5)<>4THENRETURN
57   3812 IFG%(X+10)<>3THENRETURN
C9   3814 IFG%(X+15)<>2THENRETURN
11   3816 IFG%(X+20)=1THENJY=1:JX
     =X*4:X=5:WIN=2:RETURN
76   3818 RETURN
18   3820 IFG%(X+1)<>2THENRETURN
10   3822 IFG%(X+2)<>3THENRETURN
18   3824 IFG%(X+3)<>4THENRETURN
EB   3826 IFG%(X+4)=5THENJY=3+(((
     X-1)/5)*4):X=21:WIN=1:RETURN
8C   3828 RETURN
74   3830 IFG%(X+1)<>4THENRETURN
76   3832 IFG%(X+2)<>3THENRETURN
E4   3834 IFG%(X+3)<>2THENRETURN
25   3836 IFG%(X+4)=1THENJY=3+(((
     X-1)/5)*4):X=21:WIN=1:RETURN
82   3838 RETURN
AC   3850 CT=CT+1:Y=Y+1:IFG%(X+CT
     )<>PTHENGOSUB3890
BB   3852 IFCT<4THEN3850
B2   3854 Y=Y+1:CT=CT+1:GOSUB3890
91   3856 RETURN
B6   3860 CT=CT+5:Y=Y+1:IFG%(X+CT
     )<>PTHENGOSUB4200
4E   3862 IFCT<20THEN3860
8A   3864 Y=Y+1:CT=CT+5:GOSUB4200
A7   3866 RETURN
04   3887 :
45   3888 REM ***** SCORE MARKERS
     *****
7A   3889 :
E5   3890 IFY=1THEN3904
9C   3891 IFY=2THENSC=1
9C   3892 IFY=3THENSC=5
B0   3893 IFY=4THENSC=10
37   3894 IFY=5THENSC=20
6A   3895 IFY>2THENR%(X+CT-Y)=G%(
     X+CT-Y)-1:IFR%(X+CT-Y)=0THEN
     R%(X+CT-Y)=5
B0   3896 IFY>2THENR%(X+CT+2-Y)=G
     %(X+CT+2-Y)+1:IFR%(X+CT-Y+2)
     =6THENR%(X+CT+2-Y)=1
0C   3897 IFY=5THENR%(X+CT-1)=R%(
     X+CT-3)+1:IFR%(X+CT-1)=6THEN
     R%(X+CT-1)=1
CD   3898 IFTEST=1THENS(T)=S(T)+S
     C:GOTO3904
FC   3902 PRINT"[YELLOW]":GOSUB39
     50:GOSUB3960:PRINT"[BLACK]":
     GOSUB3950
02   3904 IFCT<5THENP=G%(X+CT)
4A   3906 Y=0:RETURN
2D   3950 V1=FNA(X):V2=FNB(Y):PRI
     NT"[HOME]"LEFT$(C$,V1)LEFT$(
     D$,V2);
28   3952 FORZ=1TOY:PRINT"[CY] [C
     Y] ";:NEXT:PRINT"[CJ]"
40   3953 PRINTLEFT$(D$,V2)"[CJ,D
     OWN]"SPC((4*Y)-1)"[CJ]"
AC   3954 PRINTLEFT$(D$,V2)"[CJ]"
56   3956 PRINTLEFT$(D$,V2);
71   3957 FORZ=1TOY:PRINT" [CY] [
     CY]";:NEXT
0B   3958 RETURN
D3   3960 FORZ=1TOSC:POKEV,96:POK
     EV+1,12+Z:POKEV+4,33
F7   3962 PRINT"[HOME,DOWN5,YELLO
     W]"TAB(28);
F6   3964 IFPY=1THENPRINT"[C7]SCO
     RE"S1+Z
45   3966 IFPY=2THENPRINT"[DOWN4,
     C1]SCORE"S2+Z
83   3968 POKEV+4,32:FORZ1=0TO9:N
     EXTZ1,Z
2D   3970 IFPY=1THENS1=S1+SC
8C   3972 IFPY=2THENS2=S2+SC
D9   3974 IFWIN=0THENGOSUB4100
19   3976 RETURN
C0   4000 FR=20:FORX=0TO4:PRINT"[
     YELLOW]":GOSUB4008
8E   4002 GOSUB4030:PRINT"[BLACK]
     ":GOSUB4008:GOSUB4035:NEXT
DD   4003 PRINT"[YELLOW]":GOSUB40
     08:GOSUB4040:PRINT"[BLACK]":
     GOSUB4008:RETURN
A4   4008 PRINT"[HOME]";LEFT$(C$,
     JY-1)LEFT$(D$,3);
DF   4010 PRINT"[CJ,CY] [CY] [CY]
      [CY] [CY] [CY] [CY] [CY] [C
     Y] [CY]"
B2   4012 PRINTTAB(23)"[CJ]"
49   4014 PRINTLEFT$(D$,3)"[CJ]"
B1   4016 PRINTSPC(23)"[CJ]"
1A   4018 PRINTLEFT$(D$,3)"[CY] [
     CY] [CY] [CY] [CY] [CY] [CY]
      [CY] [CY] [CY]"
D6   4020 FORZ1=0TO100:NEXT:RETUR
     N
27   4030 POKEV+11,17:FORY=0TO10:
     FR=FR+Y:POKEV+8,FR:NEXT:RETU
     RN
07   4035 FORY=10TO3STEP-1:FR=FR-
     Y:POKEV+8,FR:NEXT:POKEV+11,0
     :RETURN
70   4040 POKEV+11,17:FORY=51TO05
     TEP-3:POKEV+8,FR+Y:FORZ1=0TO
     15:NEXTZ1,Y:POKEV+11,0
56   4041 RETURN
18   4050 FR=20:FORX=0TO4:PRINT"[
     YELLOW]":GOSUB4060
42   4052 GOSUB4030:PRINT"[BLACK]
     ":GOSUB4060:GOSUB4035:NEXT
13   4053 PRINT"[YELLOW]":GOSUB40
     60:GOSUB4040:PRINT"[BLACK]":
     GOSUB4060:RETURN
6D   4060 PRINT"[HOME,DOWN2]"LEFT
     $(D$,JX-1);
B3   4062 PRINT"[CJ,CY] [CY] "
14   4064 FORZ=0TO8:PRINTLEFT$(D$
     ,JX-1)"[RIGHT4,CJ,DOWN,LEFT5
     ,CJ]":NEXT
0C   4066 PRINTLEFT$(D$,JX-1)"[RI
     GHT4,CJ,DOWN,LEFT5,CY] [CY]"
7D   4068 RETURN
2B   4097 :
9A   4098 REM ***** BAR MARKER **
     ***
29   4099 :
B8   4100 IFS1=S2THENGOSUB1014:RE
     TURN
7B   4102 IFS1>S2THEN4120
DD   4104 SC=INT((S2-S1)/3):IFSC>
     17THEN4140
02   4106 N=LEN(LEFT$(N1$,18-SC))
11   4108 PRINT"[HOME,RVSON,C7,RI
     GHT]";LEFT$(C$,23)LEFT$(N1$,
     17-SC);
79   4110 FORZ=1TO(18-N-SC):PRINT
     " ";:NEXT:PRINT"[C*]";
7B   4112 N=LEN(N2$):PRINT"[C1,S£
     ]";:FORZ=1TO(18-N+SC):PRINT"
      ";:NEXT
C9   4114 PRINTN2$;"[RVSOFF]";:RE
     TURN
05   4120 SC=INT((S1-S2)/3):IFSC>
     18THEN4150
A2   4121 IFSC=18THEN4152
A0   4122 N=LEN(N1$):N1=LEN(N2$):
     M=(36-(18+SC)-N1)
3B   4124 PRINT"[HOME,RVSON,C7,RI
     GHT]";LEFT$(C$,23)N1$;
AE   4126 FORZ=1TO(18-N+SC):PRINT
     " ";:NEXT:PRINT"[C*]";
1C   4128 PRINT"[C1,S£]";:IFSC=18
     THENPRINT"[RVSOFF]":RETURN
F0   4129 FORZ=1TOM:PRINT" ";:NEX
```

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    T
39  4130 IFM>0THENPRINTRIGHT$(N2
    $,14)"[RVSOFF]";:RETURN
BB  4132 PRINTRIGHT$(N2$,17-SC)"
    [RVSOFF]";:RETURN
80  4140 N=LEN(N2$)
EB  4141 IFSC=18THENPRINT"[HOME]
    "LEFT$(C$,23)"[RVSON,C7,RIGH
    T,C*,C1,S£]";:FORZ=1TO(36-N)
    :PRINT" ";:NEXT
1A  4142 IFSC>18THENPRINT"[HOME]
    "LEFT$(C$,23)"[RVSON,RIGHT,C
    1,S£]";:FORZ=1TO(37-N):PRINT
    " ";:NEXT:WIN=3
17  4143 PRINTN2$"[RVSOFF]";:RET
    URN
F7  4150 PRINT"[HOME,RVSON,C7,RI
    GHT]"LEFT$(C$,23)N1$;:FORZ=1
    TO(37-N):PRINT" ";:NEXT:PRIN
    T"[C*,RVSOFF]";
B9  4151 WIN=4:RETURN
1A  4152 PRINT"[HOME,RVSON,C7,RI
    GHT]"LEFT$(C$,23)N1$;:FORZ=1
    TO(36-N):PRINT" ";:NEXT:PRIN
    T"[C*,C1,S£,RVSOFF]";
C7  4153 RETURN
4F  4197 :
20  4198 REM *****2ND SCORE MARK
    ERS *****
4D  4199 :
8B  4200 IFY=1THEN4214
7F  4201 IFY=2THENSC=1
7B  4202 IFY=3THENSC=5
AB  4203 IFY=4THENSC=10
F0  4204 IFY=5THENSC=20
9F  4205 P=X+CT-Y*5
82  4206 IFY>2THENR%(P)=G%(P)-1:
    IFR%(P)=0THENR%(P)=5
E4  4207 IFY>2THENR%(P+10)=G%(P+
    10)+1:IFR%(P+10)=6THENR%(P+1
    0)=1
2D  4208 IFY=5THENR%(P+20)=R%(P+
    10)+1:IFR%(P+20)=6THENR%(P+2
    0)=1
44  4209 IFTEST=1THENS(T)=S(T)+S
    C:GOTO4214
03  4212 PRINT"[YELLOW]":GOSUB42
    20:GOSUB3960:PRINT"[BLACK]":
    GOSUB4220
9B  4214 IFCT<25THENP=G%(X+CT)
63  4216 Y=0:RETURN
5B  4220 PRINT"[HOME]"LEFT$(C$,2
    +((CT/5)-Y)*4)LEFT$(D$,4*X-1
    );
C0  4222 PRINT"[CJ,CY] [CY] ":FO
    RZ=1TOY*2-1:PRINTLEFT$(D$,4*
    X-1)" [RIGHT3,CJ,DOWN,LEFT5,
    CJ]":NEXT
0B  4224 PRINTLEFT$(D$,4*X-1)"[R
    IGHT4,CJ,DOWN,LEFT5,CY] [CY]
    "
1C  4226 RETURN
98  4497 :
E9  4498 REM ***** INSTRUCTIONS
    *****
9E  4499 :
4B  4500 POKE53280,11:POKE53281,
    0:PRINT"[CLR,C7,DOWN]"TAB(14
    )"INSTRUCTIONS"
ED  4502 PRINTTAB(14)"[CT12]"
2B  4504 PRINT"[DOWN]  THE OBJEC
    T OF THE GAME IS TO MOVE "
33  4506 PRINT" NUMBERS AROUND A
     GRID TO CREATE"
93  4508 PRINT" SCORING NUMERICA
    L SEQUENCES."
23  4510 PRINT"[DOWN]  PLAYER 1
    CAN MOVE A COLUMN UP/DOWN"
E8  4512 PRINT"[DOWN]  PLAYER 2
    CAN MOVE A ROW LEFT/RIGHT"
97  4514 PRINT"[DOWN] POSITION T
    HE ARROW IN THE DIRECTION"
65  4516 PRINT" REQUIRED BY JOYS
    TICK (PORT 2) OR"
58  4518 PRINT"[YELLOW]"TAB(7)E$
    " = W"TAB(22)"[UP]"G$" = J[D
    OWN]"
C5  4520 PRINTTAB(7)F$" = S"TAB(
    22)"[UP]"H$" = L"
41  4522 PRINT"[C7,DOWN] THEN PR
    ESS [YELLOW]FIRE/SPACE [C7]T
    O START THE MOVE"
60  4524 PRINTTAB(8)"[RED,DOWN]P
    RESS ANY KEY TO CONTINUE";
04  4526 X=PEEK(197):IFX=64THEN4
    526
A1  4528 PRINT"[CLR,C7]"
09  4532 PRINT" POINTS CAN BE SC
    ORED FOR"
58  4534 PRINT"[DOWN] 2 SIMILAR
    NUMBERS IN LINE.......1 PT"
30  4536 PRINT"[DOWN] 3 SIMILAR
    NUMBERS IN LINE.......5 PTS"
95  4538 PRINT"[DOWN] 4 SIMILAR
    NUMBERS IN LINE......10 PTS"
83  4540 PRINT"[DOWN] 5 SIMILAR
    NUMBERS IN LINE......20 PTS"
11  4541 PRINT"[DOWN] WINNING BO
    NUS.................100 PTS"
A8  4542 PRINT"[DOWN2] A GAME MA
    Y BE WON BY TWO MEANS"
B1  4544 PRINT"[DOWN] 1)MANIPULA
    TING THE GRID TO PRODUCE A"
B1  4546 PRINT"  SEQUENCE OF 123
    45 OR 54321"
53  4548 PRINT"[DOWN] 2)CREATING
     A LARGE DIFFERENTIAL IN"
ED  4550 PRINT"  POINTS AS OBSER
    VED BY A MARKER AT THE"
E3  4552 PRINT"  BOTTOM OF THE S
    CREEN"
53  4554 PRINTTAB(8)"[RED,DOWN]P
    RESS ANY KEY TO CONTINUE"
01  4556 X=PEEK(197):IFX=64THEN4
    556
B7  4558 PRINT"[CLR,C7]"
82  4560 PRINT" AFTER THE POINTS
     HAVE BEEN CALCULATED"
AF  4562 PRINT" FOR EACH TURN, A
    LL3,4 AND 5 SEQUENCES"
96  4564 PRINT" WILL BE ALTERED
    WITHIN THE GRID."
18  4566 PRINT"[DOWN,SPC5]X X X
    = (X-1) X (X+1)
30  4568 PRINT"[DOWN,SPC3]X X X
    X = (X-1) X (X+1) X"
7A  4570 PRINT"[DOWN] X X X X X
    = (X-1) X (X+1) X (X+2)"
9B  4572 PRINT"[DOWN] IF TWO OR
    MORE SEQUENCES CROSS EACH"
44  4574 PRINT" OTHER THE FINAL

    GRID MAY HAVE A NUMBER"
1B  4576 PRINT" THAT HAS BEEN AL
    TERED TWICE!"
EA  4578 PRINT"[DOWN] 12345 SEQU
    ENCES ARE TAKEN INTO ACCOUNT
    "
B0  4580 PRINT" BEFORE AND AFTER
     THE ALTERATION SO"
77  4582 PRINT" THOUGHT IS NEEDE
    D BEFORE MOVING."
02  4584 PRINT"[DOWN] AN EXTRA F
    EATURE IS A ONE PLAYER"
C1  4586 PRINT" OPTION WHERE THE
     COMPUTER IS GIVEN"
0F  4588 PRINT" A THINKING LEVEL
     OF 1-5"
7F  4590 PRINTTAB(8)"[RED,DOWN]P
    RESS ANY KEY TO CONTINUE"
AD  4592 X=PEEK(197):IFX=64THEN4
    592
8D  4594 RETURN
3C  4597 :
2B  4598 REM ***** TITLE PAGE **
    ***
32  4599 :
C8  4600 POKE53281,11:POKE53280,
    11:POKE53272,(PEEK(53272)AND
    240)OR8:PRINT"[CLR]"
60  4602 PRINTTAB(15)"[BLACK,CP4
    ,SPC3,CP4]"
6B  4604 Y=14
22  4606 FORX=3TO13STEP2
8A  4608 PRINTTAB(Y)T1$SPC(X)T2$
A0  4610 PRINTTAB(Y)T3$SPC(X)T4$
66  4612 PRINTTAB(Y)T5$SPC(X)T6$
1C  4614 Y=Y-1:NEXT
2E  4616 POKE2072,31:POKE195,1
F6  4618 PRINT"[HOME,DOWN2]"
6B  4620 PRINTTAB(15)Z1$"[DOWN]"
    :GOSUB4650
DC  4621 PRINTTAB(14)Z2$"[DOWN]"
    :GOSUB4650
F5  4622 PRINTTAB(13)Z3$"[DOWN]"
    :GOSUB4650
EE  4623 PRINTTAB(12)Z4$"[DOWN]"
    :GOSUB4650
8F  4624 PRINTTAB(11)Z5$"[DOWN]"
    :GOSUB4650
E8  4625 PRINTTAB(10)Z6$"[DOWN]"
    :GOSUB4650
10  4626 GOSUB4650
34  4628 PRINT"[HOME,DOWN2]"
D3  4630 PRINTTAB(24)Z7$"[DOWN]"
    :GOSUB4650
9E  4631 PRINTTAB(25)Z2$"[DOWN]"
    :GOSUB4650
A7  4632 PRINTTAB(26)Z3$"[DOWN]"
    :GOSUB4650
84  4633 PRINTTAB(27)Z4$"[DOWN]"
    :GOSUB4650
6C  4634 PRINTTAB(28)Z8$"[DOWN]"
    :GOSUB4650
A9  4635 PRINTTAB(29)Z5$"[DOWN]"
    :GOSUB4650
73  4636 PRINT"[HOME]"LEFT$(C$,1
    3)TAB(19)"[WHITE]BY[DOWN]"
FF  4638 PRINTTAB(18)"J.L.P[DOWN
    ]"
80  4639 PRINTTAB(18)"*1987[DOWN
    4]"
51  4640 PRINT"[YELLOW,RIGHT2]IN
    STRUCTIONS[SPC4]F7"
16  4641 PRINT"[RIGHT2]PROCEED T
    O GAME F1"
09  4642 X=PEEK(195):IFX>0THEN46
    42
8E  4643 X=PEEK(197):IFX=64THEN4
    643
5E  4644 IFX=3THENGOSUB4500:GOTO
    4646
9C  4645 IFX<>4THEN4643
CE  4646 POKE2072,16:POKE53272,
    (PEEK(53272)AND240)OR4:RETUR
    N
48  4650 FORX=0TO320:NEXT:RETURN
0E  9997 :
22  9998 REM ***** NORMALISE PRO
    G. *****
0C  9999 :
A4  10000 POKE56578,PEEK(56578)O
    R3
F0  10001 POKE56576,(PEEK(56576)
    AND252)OR3
CB  10002 POKE53272,(PEEK(53272)
    AND240)OR4
32  10003 POKE53280,14:POKE53281
    ,6
79  10004 POKE648,4:PRINT"[CLR,C
    7]";
```

FUNCTION KEY TEMPLATE

Please refer to Listings before typing in any programs.

PROGRAM: FUNK KEY

```
BB  1 GOTO3
FF  2 SAVE"@0:KEY TEMP",8:VERIFY
    "KEY TEMP",8:STOP
09  3 REM CHANGE ,8 TO ,1 IN ABO
    VE LINE IF USING TAPE
A5  10 REM *** YOUR COMMODORE **
    *
A6  20 REM *** 64 FUNCTION KEY T
    EMPLATE ***
D7  30 REM *** PROGRAM BY JOHN A
    LLISON ***
49  40 REM *** INITIAL SCREEN DI
    SPLAY ***
94  50 PRINT"[CLR]":PRINT"[SPC8]
    FUNCTION KEY TEMPLATE"
6B  60 PRINT"[SPC11]BY JOHN ALLI
    SON"
80  70 PRINT:PRINT
44  80 PRINT"[SPC4]A PROGRAM TO
    DRAW A TEMPLATE"
6A  90 PRINT"[SPC4]SHOWING UP TO
     16 FUNCTION KEY"
96  100 PRINT"[SPC4]DEFINIIONS.
    FOR USE WITH THE"
89  110 PRINT"[SPC4]COMMODORE 64
     COMPUTER AND THE"
45  120 PRINT"[SPC4]COMMODORE 15
    20 PRINTER/PLOTTER"
F7  130 PRINT"[SPC4]WITH FOUR PE
    NS - BLACK, BLUE,"
6A  140 PRINT"[SPC11]RED AND GRE
    EN."
88  150 PRINT:PRINT:PRINT:PRINT"
    DO YOU WANT TO PRODUCE A TEM
    PLATE? (Y/N)
E8  160 GETA$:IFA$=""THEN160
B9  170 IFA$="N"THEN1810
63  180 IFA$<>"Y"THEN160
B7  190 REM *** INPUT LABEL NAME
    S ***
84  200 PRINT"[CLR]":PRINT:PRINT
8E  210 PRINT"[SPC8]INPUT TITLE
    & KEY LABELS":PRINT
86  220 PRINT"[SPC4]YOU CAN HAVE
     UP TO 16 LABELS"
CC  230 PRINT"[SPC4]& CAN LEAVE
    ANY LABEL BLANK"
26  240 PRINT"[SPC4]BY PRESSING
    THE RETURN KEY ONLY":PRINT
5A  250 PRINT"[SPC4]EACH LABEL C
    AN BE UP TO 9"
C5  260 PRINT"[SPC4](7 FOR F1/F3
    /F9/F11)"
23  270 PRINT"[SPC4]CHARACTERS L
    ONG (INCLUDING"
0A  280 PRINT"[SPC4]LETTERS, NUM
    BERS & SPACES).":PRINT
EE  290 PRINT"[SPC4]THE TITLE CA
    N BE UP TO 13"
D6  300 PRINT"[SPC4]CHARACTERS L
    ONG.":PRINT:PRINT
E7  310 PRINT"[SPC4]DO YOU WANT
    MORE THAN 8 LABELS?(Y/N)"
09  320 GET B$:IF B$=""THEN320
AB  330 IF B$="Y" THEN N=16:DIMF
    $(16)
1B  340 IF B$="N" THEN N=8
6C  350 IF N=0 THEN320
A1  360 PRINT"[CLR]":PRINT:PRINT
A3  370 PRINT"[SPC4]ENTER THE TE
    MPLATE TITLE AND PRESS"
19  380 PRINT"[SPC4]THE [RETURN]
     KEY.":PRINT:PRINT"[SPC4]";
19  390 I=0:INPUTF$(I)
97  400 GOSUB1820
2F  410 IF A=1 THEN370
AA  420 GOSUB1890
A7  430 IF B=2 THEN370
98  440 FOR I=1 TO N
7C  450 PRINT:PRINT"[SPC4]ENTER
    THE LABEL FOR FUNCTION KEY";
    I
95  460 PRINT"[SPC4]AND PRESS TH
    E [RETURN] KEY.":PRINT:PRINT
    "[SPC4]";
D6  470 INPUTF$(I)
E7  480 GOSUB1820
FC  490 IF A=1 THEN450
FA  500 GOSUB1890
B4  510 IF B=2 THEN450
88  520 NEXT
31  530 REM *** DISPLAY LABEL NA
    MES ***
E2  540 PRINT"[CLR]":PRINT:PRINT
    "[SPC6]TEMPLATE TITLE & KEY
    LABELS"
72  550 PRINT:PRINT
50  560 PRINT"[SPC7]TEMPLATE TIT
    LE = ";F$(0)
D8  570 FOR J=1 TO N
D9  580 PRINT"[SPC5]FUNCTION KEY
     ";J;" =";F$(J)
D2  590 NEXT
90  600 PRINT:PRINT"[SPC3]ARE YO
    U HAPPY WITH THESE NAMES?(Y/
    N)"
00  610 GETD$:IF D$=""THEN610
49  620 IFD$="N"THEN360
7A  630 IFD$<>"Y"THEN610
DE  640 REM *** STRIP TITLE LEAD
     & TRAIL SPACES ***
95  650 IF LEFT$(F$(0),1)=" "THE
    NF$(0)=RIGHT$(F$(0),LEN F$(0
    )-1): GOTO650
20  660 IF RIGHT$(F$(0),1)=" "TH
    ENF$(0)=LEFT$(F$(0),LEN F$(0
    )-1): GOTO660
80  670 REM *** CENTRE TITLE ***
33  680 IF LEN(F$(0))>11 THEN720
76  690 FOR C=1 TO INT((13-(LEN(
    F$(0))))/2)
22  700 F$(0)=" "+F$(0)
4A  710 NEXT
88  720 REM *** DRAW BLACK OUTLI
    NE ***
33  730 PRINT"[CLR]":PRINT"[DOWN
    10]"
E2  740 PRINT"[SPC9]NOW PLOTTING
     OUTLINE"
1F  750 OPEN1,6,1
93  760 PRINT#1
48  770 PRINT#1,"M",25,0
80  780 PRINT#1,"D",400,0
0A  790 PRINT#1,"D",400,-564
38  800 PRINT#1,"D",0,-564
3B  810 PRINT#1,"D",0,-240
4E  820 PRINT#1,"D",25,-240
1D  830 PRINT#1,"D",25,0
89  840 PRINT#1,"M",25,-40
2D  850 PRINT#1,"D",400,-40
56  860 PRINT#1,"M",280,-40
2E  870 PRINT#1,"D",280,-434
66  880 PRINT#1,"D",125,-434
35  890 PRINT#1,"D",125,-40
F8  900 PRINT#1,"M",25,-137
20  910 PRINT#1,"D",125,-137
05  920 PRINT#1,"M",280,-137
EC  930 PRINT#1,"D",400,-137
CD  940 PRINT#1,"M",25,-235
97  950 PRINT#1,"D",125,-235
82  960 PRINT#1,"M",280,-235
93  970 PRINT#1,"D",400,-235
94  980 PRINT#1,"M",0,-332
BB  990 PRINT#1,"D",125,-332
92  1000 PRINT#1,"M",280,-332
3F  1010 PRINT#1,"D",400,-332
EB  1020 PRINT#1,"M",0,-434
B9  1030 PRINT#1,"D",400,-434
88  1040 PRINT#1,"M",200,-434
AF  1050 PRINT#1,"D",200,-564
47  1060 REM *** PRINT BLACK LET
    TERING ***
3D  1070 PRINT"[CLR]":PRINT"[DOW
    N10]"
F5  1080 PRINT"[SPC6]NOW PRINTIN
    G BLACK LETTERING"
F3  1090 PRINT#1,"M",60,-35
79  1100 OPEN4,6,0
59  1110 OPEN3,6,3
35  1120 PRINT#3,2
C9  1130 PRINT#4,F$(0)
70  1140 PRINT#3,1
C4  1150 PRINT#1,"M",35,0
B0  1160 PRINT#4,F$(1)
EE  1170 PRINT#1,"M",35,-74
22  1180 PRINT#4,F$(3)
7F  1190 PRINT#1,"M",10,-83
14  1200 PRINT#4,F$(5)
CF  1210 PRINT#1,"M",10,-78
EE  1220 PRINT#4,F$(7)
DD  1230 PRINT#1,"M",10,-100
A3  1240 PRINT#4,"  F KEY ONLY"
02  1250 REM *** PRINT BLUE LETT
    ERING ***
27  1260 PRINT"[CLR]":PRINT"[DOW
    N10]"
38  1270 PRINT"[SPC6]NOW PRINTIN
    G BLUE LETTERING"
6C  1280 OPEN2,6,2
16  1290 PRINT#2,1
2C  1300 PRINT#1,"M",290,435
90  1310 PRINT#4,F$(2)
6C  1320 PRINT#1,"M",290,-74
96  1330 PRINT#4,F$(4)
2E  1340 PRINT#1,"M",290,-83
74  1350 PRINT#4,F$(6)
58  1360 PRINT#1,"M",290,-78
82  1370 PRINT#4,F$(8)
20  1380 PRINT#1,"M",205,-100
DF  1390 PRINT#4,"  SHIFT + F KE
    Y"
72  1400 IF N=8 THEN1710
06  1410 REM *** PRINT RED LETTE
    RING ***
1A  1420 PRINT"[CLR]":PRINT"[DOW
    N10]"
C4  1430 PRINT"[SPC7]NOW PRINTIN
    G RED LETTERING"
76  1440 PRINT#2,3
07  1450 PRINT#1,"M",35,390
23  1460 PRINT#4,F$(9)
C5  1470 PRINT#1,"M",35,-74
DE  1480 PRINT#4,F$(11)
66  1490 PRINT#1,"M",10,-83
44  1500 PRINT#4,F$(13)
48  1510 PRINT#1,"M",10,-78
4A  1520 PRINT#4,F$(15)
06  1530 PRINT#1,"M",10,-100
68  1540 PRINT#4,"  CBM + F KEY"
95  1550 REM *** PRINT GREEN LET
    TERING ***
29  1560 PRINT"[CLR]":PRINT"[DOW
    N10]"
7B  1570 PRINT"[SPC6]NOW PRINTIN
    G GREEN LETTERING"
22  1580 PRINT#2,2
F9  1590 PRINT#1,"M",290,435
00  1600 PRINT#4,F$(10)
59  1610 PRINT#1,"M",290,-74
66  1620 PRINT#4,F$(12)
21  1630 PRINT#1,"M",290,-83
FC  1640 PRINT#4,F$(14)
45  1650 PRINT#1,"M",290,-78
```

```
92   1660 PRINT#4,F$(16)
D3   1670 PRINT#1,"M",205,-100
D3   1680 PRINT#4,"  CTRL + F KEY
     ."
76   1690 PRINT#2,0
FD   1700 REM *** END SEQUENCE **
     *
6A   1710 PRINT#1,"M",0,-100
BD   1720 OPEN7,6,7
87   1730 PRINT#7
A3   1740 CLOSE1
AE   1750 CLOSE2
79   1760 CLOSE3
84   1770 CLOSE4
91   1780 CLOSE7
FB   1790 PRINT"[CLR]":PRINT"[DOW
     N10]"
DD   1800 PRINT"[SPC3]FUNCTION KE
     Y TEMPLATE NOW FINISHED"
99   1810 END
95   1820 REM *** INPUT VERIFICAT
     ION ***
5B   1830 IF F$(I)=CHR$(13) THEN
     F$(I)=" "
F9   1840 D=9:A=0
51   1850 IF(I=1)OR(I=3)OR(I=9)OR
     (I=11)THEN D=7
BE   1860 IF I=0 THEN D=13
6C   1870 IF LEN(F$(I))>D THEN PR
     INT"[SPC4]TOO MANY CHARS. PL
     EASE RE-ENTER":PRINT:A=1
D1   1880 RETURN
F8   1890 REM *** INPUT AGREEMENT
      ROUTINE ***
D3   1900 B=0
6C   1910 PRINT:PRINT"[SPC4]ARE Y
     OU SATISFIED"
A4   1920 PRINT"[SPC4]WITH THIS N
     AME (Y/N)"
13   1930 GET C$: IF C$="" THEN19
     30
0C   1940 IF C$="Y" THEN B=1
B6   1950 IF C$="N" THEN B=2
9C   1960 IF B=0 THEN1930
37   1970 RETURN
```

PLUS/4 AND C16 DISK MENU

Please refer to Listings before typing in any programs.

PROGRAM: DISK MENU

```
10 REM ************************
***********
20 REM *
       *
30 REM * COMMODORE 1541 OR ENHA
NCER 2000 *
40 REM *
       *
50 REM *          DISK MENU
       *
60 REM *
       *
70 REM *     FOR THE PLUS/4 OR
C16    *
80 REM *
       *
90 REM *         BY JEFFREY HOYL
E      *
100 REM *
       *
110 REM *             1987
       *
120 REM *
       *
130 REM ***********************
***********
140 REM
150 REM
160 DATA 0,11,16,10,0,158,52,49,
49,56,0,0,0,70,70,68, 609
170 DATA 50,0,34,16,40,0,169,147
,32,210,255,169,153,32,210,255,
1772
180 DATA 169,3,141,21,255,169,67
,141,25,255,169,0,133,208,169,39
, 1964
190 DATA 133,209,169,49,133,210,
169,36,141,84,35,169,48,141,85,3
5, 1846
200 DATA 169,58,141,86,35,169,4,
133,211,169,0,133,212,169,42,141
, 1872
210 DATA 87,35,24,162,0,189,24,1
8,32,210,255,232,224,120,208,245
, 2065
220 DATA 24,166,211,164,212,32,2
40,255,169,15,162,8,160,15,32,18
6, 2051
230 DATA 255,32,192,255,169,1,16
2,8,160,0,32,186,255,169,4,162,
2042
240 DATA 84,160,35,32,189,255,32
,192,255,162,1,32,198,255,160,0,
 2042
250 DATA 32,207,255,153,0,38,200
,192,32,208,245,160,26,185,0,38,
 1971
260 DATA 201,80,240,15,136,192,2
3,208,244,32,183,255,201,0,208,1

03, 2321
270 DATA 76,142,16,162,6,192,24,
240,3,232,234,234,165,210,32,210
, 2178
280 DATA 255,169,32,32,210,255,1
60,0,189,0,38,201,34,208,8,224,
2015
290 DATA 7,208,14,232,76,200,16,
145,208,32,210,255,232,200,76,20
0, 2311
300 DATA 16,169,0,145,208,24,165
,208,105,32,133,208,165,209,105,
0, 1892
310 DATA 133,209,230,211,165,211
,201,20,208,6,133,212,169,4,133,
211, 2456
320 DATA 24,166,211,164,212,32,2
40,255,230,210,165,210,201,58,20
8,153, 2739
330 DATA 169,65,133,210,76,169,1
6,32,204,255,169,1,32,195,255,16
9, 2150
340 DATA 15,32,195,255,24,162,22
,160,0,32,240,255,162,0,189,104,
 1847
350 DATA 18,32,210,255,232,224,8
0,208,245,169,0,133,208,169,39,1
33, 2355
360 DATA 209,32,159,255,240,251,
201,50,48,247,201,90,16,243,201,
58, 2501
370 DATA 48,4,201,65,48,235,197,
210,176,231,56,233,48,201,10,144
, 2107
380 DATA 2,233,7,170,202,224,0,2
40,16,24,165,208,105,32,133,208,
 1969
390 DATA 165,209,105,0,133,209,7
6,100,17,160,0,177,208,200,201,0
, 1960
400 DATA 208,249,136,152,166,208
,164,209,32,189,255,162,84,189,1
95,17, 2615
410 DATA 157,50,3,202,208,247,16
9,5,133,239,169,82,141,39,5,169,
 2018
420 DATA 85,141,40,5,169,78,141,
41,5,169,13,141,42,5,160,1, 1236
430 DATA 132,43,162,16,134,44,16
9,0,133,10,169,1,133,173,32,194,
 1545
440 DATA 128,76,51,3,169,0,32,21
3,255,165,43,133,3,165,44,133, 1
613
450 DATA 4,160,0,169,4,32,123,3,
177,3,240,7,32,121,3,169, 1247
460 DATA 0,240,245,32,121,3,177,
3,240,4,169,0,240,234,32,121, 18
61
470 DATA 3,177,3,240,4,169,0,240
,223,32,121,3,234,234,234,165, 2
082
480 DATA 3,133,45,165,4,133,46,7
6,13,128,169,1,24,101,3,133, 117
7
490 DATA 3,169,0,101,4,133,4,96,
42,42,42,42,42,42,42,42, 846
500 DATA 42,42,42,42,42,42,42,42
,42,42,42,42,42,42,42,42, 672
510 DATA 42,42,42,42,42,42,42,42
,42,42,42,42,42,42,42,42, 672
520 DATA 42,32,32,32,32,32,68,73
,83,75,32,77,69,78,85,32, 874
530 DATA 66,89,32,74,69,70,70,82
,69,89,32,72,79,89,76,69, 1127
540 DATA 32,32,32,32,32,32,32,42
,42,42,42,42,42,42,42,42, 602
550 DATA 42,42,42,42,42,42,42,42
,42,42,42,42,42,42,42,42, 672
560 DATA 42,42,42,42,42,42,42,42
,42,42,42,42,42,42,42,42, 672
570 DATA 83,69,76,69,67,84,32,80
,82,79,71,82,65,77,32,66, 1114
580 DATA 89,32,80,82,69,83,83,73
,78,71,32,65,68,74,65,67, 1111
590 DATA 69,78,84,32,75,69,89,46
,255,255,255,255,255,255,255,255
, 2582,-1
600 A=4096:DO:B=0:FORC=1TO16:REA
DD:IFD=-1THENPRINT"OK...":END
610 B=B+D:POKEA,D:A=A+1:NEXT:REA
DD
620 IFD<>BTHENPRINT"DATA ERROR I
N LINE";PEEK(63)+256*PEEK(64):EN
D:ELSELOOP
```

COMMODORE 128 PREFERENCES

Please refer to Listings before typing in any programs.

PROGRAM: 128 PREFERENCE

```
0 rem ** once program has finish
ed, press run/stop & restore to
change defaults
1 rem ****************************
*******
2 rem ****************************
*******
3 rem ****** preferences manager
 ******
4 rem ***** (c) d. anderson 1986
```

```
******
5 rem ***************************
*******
6 rem ***************************
*******
7 rem ** set up screen/titles **
8 print chr$(14);
10 scnclr
15 gosub 20000
20 gr=rgr(0)
30 if gr=0 then print spc(10);:e
lse print spc(30);
40 print "Preferences Manager"
50 if gr=0 then print spc(9);:el
se print spc(29);
60 print"-------------------"
70 print
80 print chr$(27);"t";:rem prote
ct titles with window
100 rem ** get options for prefe
ences **
115 if gr=0 then sp=10:else sp=3
0
270 gosub 10000
280 print
285 do
290 :   input "40-cols Backgroun
d >";p4
295 loop until p4<16
310 scnclr
320 gosub 10000
330 print
335 do
340 :  input "40-cols border >";
b4
345 loop until b4<16
360 scnclr
370 gosub 10000
380 print
385 do
390 :  input "40-cols foreground
 >";f4
395 loop until f4<16
410 scnclr
416 print "VIC cursor block, or
flashing (B/F) >";
417 do
420 :  getkey bf$
430 loop until bf$="b" or bf$="f
"
440 if bf$="b" then bf=64:else b
f=0
450 scnclr
460 print "Keys to repeat (Y/N)
>";
470 do
480 :  getkey rp$
490 loop until rp$="y" or rp$="n
"
500 if rp$="y" then rp=128:else
rp=0
510 scnclr
520 print spc(sp);"1-Solid,  blo
ck"
530 print spc(sp);"2-Solid,  und
erline"
540 print spc(sp);"3-Slow flashi
ng,  block"
550 print spc(sp);"4-Slow flashi
ng,  underline"
560 print spc(sp);"5-Fast flashi
ng,  block"
570 print spc(sp);"6-Fast flashi
ng,  underline"
580 print
585 do
590 input "VDC (80-cols) cursor
type >";vc
595 loop until vc<7
600 restore 20000
610 no=vc
620 for a=1 to no
630 :  next vc
640 next a
650 scnclr
660 gosub 10000
670 print
680 do
690 :  input "vdc (80-cols) back
ground colour >";b8
700 loop until b8<16
710 restore 20010
720 no=b8
730 for a=0 to no
740 :  read b8
750 next a
760 scnclr
770 gosub 10000
780 print
790 do
800 : input "vdc (80-cols) foreg
round colour >";f8
810 loop until f8<16
820 restore 20010
830 no=f8
840 for a=0 to no
850 :  read a
860 next a
870 scnclr
880 print "Upper or Lower case (
U/L) >";
890 do
900 :  getkey uc$
910 loop until uc$="u" or uc$="l
"
920 if uc$="u" then uc=20
930 if uc$="l" then uc=22:f4=f4+
128:f8=f8+128
940 scnclr
950 print "Disable char-set chan
ge (SFT/C=)? (Y/N) >";
960 do
970 :  getkey sc$
980 loop until sc$="y" or sc$="n
"
990 if sc$="y" then cs=0:else sc
=128
995 rem ** poke options into pre
ference program **
1000 poke dec("146b"),p4:rem pap
er colour for 40-column screen
1010 poke dec("1466"),b4:rem bor
der colour for 40-column screen
1020 poke dec("1462"),f4:rem for
eground colour for 40-column scr
een
1030 poke dec("1475"),bf:rem cur
sor type for 40-column screen
1040 poke dec("1470"),rp:rem opt
ion determines if keys will repe
at
1050 poke dec("147a"),vc:rem cur
sor type for 80- column screen
1060 poke dec("1496"),b8:rem bac
kround colour for 80-column scre
en
1070 poke dec("145d"),f8:rem for
eground colour for 80-column scr
een
1080 poke dec ("1483"),sc:rem de
termines if shift/cbm is disable
d
1090 poke dec ("1487"),uc:rem de
termines default char-set (upper
/lower)
1100 rem ***********************
******
1110 rem *** err$et up preferenc
e file **
1120 rem ***********************
******
1130 scnclr
1140 print"Saving preference fil
e to disk..."
1150 bsave "preferences",b0,p486
4 to p5290
1160 print
1170 print "Should I set up the
boot sector, so that preferences
 is loaded automatically ?"
1180 do
1190 :    getkey op$
1200 loop until op$="y" or op$="
n"
1210 if op$="y" then begin:
1220 :  open 15,8,15
1230 :  open 2,8,2,"#"
1240 :  print#15,"b-a 0";1;0:rem
 allocate boot block
1250 :  if ds=65 then begin:
1260 :    print ds$;" - boot sec
tor not available"
1270 :    dclose#2:dclose#15
1280 :    end
1290 : bend
1300 : print#15,"u1:2 0 1 0"
1310 : print#15, "b-p 2 0"
1320 : print#2,"cbm"+chr$(2)+chr
$(19)+chr$(0)+chr$(0)+"preferenc
es"+chr$(0)+chr$(0);
1330 : print#2,chr$(162);chr$(26
);chr$(160);chr$(11);chr$(76);ch
r$(165);chr$(175);
1340 : print#2,"boot"+chr$(34)+"
preferences"+chr$(0)
1350 : print#15,"u2:2 0 1 0"
1360 bend
1370 dclear
1380 end
9999 rem ** menu of colours subr
outine **
10000 print spc(sp);" 0-Black"
10010 print spc(sp);" 1-White"
10020 print spc(sp);" 2-Red"
10030 print spc(sp);" 3-Cyan"
10040 print spc(sp);" 4-Purple"
10050 print spc(sp);" 5-Green"
10060 print spc(sp);" 6-Blue"
10070 print spc(sp);" 7-Yellow"
10080 print spc(sp);" 8-Orange"
10090 print spc(sp);" 9-Brown"
10100 print spc(sp);"10-Light Re
d"
10110 print spc(sp);"11-Dark Gre
y"
10120 print spc(sp);"12-Medium G
rey"
10130 print spc(sp);"13-Green"
10140 print spc(sp);"14-Blue"
10150 print spc(sp);"15-Grey"
10160 return
20000 data 0,7,96,103,64,71:rem
data for 80-col cursor type
20010 data 0,15,8,7,11,4,2,13,10
,12,9,6,1,5,3,16:rem data for 80
-col colours
20100 rem ** poke machine-code d
ata."
20105 restore 30000
20107 print "Loading machine-cod
e data."
20110 for li=0 to 51
20120 :  for po=0 to 7
20130 :    read no$
20140 :    poke dec("1300")+li*8
+po,dec(no$)
20145 print "[HOME][DOWN][DOWN]L
ine >";30000+(li*10)
20150 tl=tl+dec(no$)
20160 :  next po
20170 :  read ck$
20180 :  if dec(ck$)<>tl then pr
int "data error":stop
20190 :  tl=0
20200 next li
20205 scnclr
20210 return
20220 rem **********************
*****
20230 rem **** machine code data
 ****
20240 rem **********************
```

```
*****
30000 data 03,40,78,a9,2f,8d,14,03,237
30010 data a9,13,8d,15,03,a9,eb,8d,382
30020 data 48,03,a9,13,ad,00,0a,8d,24b
30030 data 00,13,ad,01,0a,8d,01,13,16c
30040 data 8d,49,03,a9,44,8d,00,0a,25d
30050 data a9,14,8d,01,0a,58,60,d8,2e5
30060 data 20,4a,13,90,12,20,f8,f5,32c
30070 data 20,d0,ee,ad,0d,dc,ad,04,425
30080 data 0a,4a,90,03,20,06,40,4c,199
30090 data 33,ff,38,ad,19,d0,29,01,32a
30100 data f0,07,8d,19,d0,a5,d8,c9,4b3
30110 data ff,f0,70,2c,11,d0,30,04,3a0
30120 data 29,40,d0,31,38,a5,d8,f0,40f
30130 data 2c,24,d8,50,06,ad,34,0a,269
30140 data 8d,12,d0,a5,01,29,fd,09,344
30150 data 04,48,ad,2d,0a,48,ad,11,236
30160 data d0,29,7f,09,20,a8,ad,16,30c
30170 data d0,24,d8,30,03,29,ef,2c,343
30180 data 09,10,aa,d0,29,a9,ff,8d,3f1
30190 data 12,d0,a5,01,09,02,29,fb,2b7
30200 data 05,d9,48,ad,2c,0a,48,ad,2fe
30210 data 11,d0,29,5f,a8,ad,16,d0,3a4
30220 data 29,ef,aa,b0,09,a2,06,ca,3ed
30230 data d0,fd,ea,ea,ea,aa,68,8d,62a
30240 data 18,d0,68,85,01,8c,11,d0,343
30250 data 8e,16,d0,b0,13,ad,30,d0,3e4
30260 data 29,01,f0,0c,a5,d8,29,40,30c
30270 data f0,06,ad,11,d0,10,01,38,2cd
30280 data 58,90,07,20,5d,c5,20,e7,338
30290 data c6,38,60,14,0d,1d,88,85,2a9
30300 data 86,87,11,33,d7,c1,34,da,3f7
30310 data d3,c5,01,35,d2,c4,36,c3,45d
30320 data c6,d4,d8,37,d9,c7,38,c2,543
30330 data c8,d5,d6,39,c9,ca,30,cd,53c
30340 data cb,cf,ce,2b,d0,cc,2d,2e,48a
30350 data 3a,40,2c,5c,2a,3b,13,01,17b
30360 data 3d,5e,2f,31,5f,04,32,20,1b0
30370 data 02,d1,03,84,38,35,09,32,202
30380 data 34,37,31,1b,2b,2d,0a,0d,126
30390 data 36,39,33,08,30,2e,91,11,1aa
30400 data 9d,1d,ff,ff,a9,2f,8d,14,431
30410 data 03,a9,13,8d,15,03,a9,eb,2f8
30420 data 8d,48,03,a9,13,8d,49,03,26d
30430 data a5,d7,f0,05,a9,8f,4c,63,458
30440 data 14,a9,80,85,f1,a9,06,8d,3ef
30450 data 20,d0,a9,01,8d,21,d0,a9,3c1
30460 data 80,8d,22,0a,a9,00,8d,26,295
30470 data 0a,a9,40,8d,2b,0a,a9,00,25e
30480 data 85,f6,a9,00,85,f7,a9,16,45f
30490 data 8d,2c,0a,a2,1a,8e,00,d6,2e3
30500 data 2c,00,d6,10,fb,a9,02,8d,345
30510 data 01,d6,6c,00,13,26,0a,a9,22f
```

ADVENTURE KIT II

Please refer to Listings before typing in any program.

PROGRAM: EDITOR.MC

```
75  10 rem ***********************
58  20 rem * adventure kit part 2 *
5e  30 rem *   text editor code   *
07  40 rem ***********************
14  2000 forl=0to89:cx=0:ford=0to15:reada:cx=cx+a:poke49664+l*16+d,a:nextd
82  2010 reada:ifa<>cxthenprint"error in line";2040+(l*10):stop
0f  2020 nextl:end
ad  2040 data76,214,196,76,168,194,172,62,3,185,160,4,73,128,153,160,2024
12  2050 data4,32,34,194,172,62,3,185,160,4,73,128,153,160,4,76,1444
77  2060 data109,194,162,2,160,1,136,208,253,202,208,248,96,162,15,160,2316
78  2070 data15,136,208,253,202,208,248,96,169,147,32,210,255,32,212,194,2617
64  2080 data169,230,160,194,32,30,171,160,0,162,15,24,32,240,255,169,2043
b6  2090 data62,160,195,32,30,171,160,0,162,11,24,32,240,255,169,103,1806
e1  2100 data160,195,32,30,171,160,0,140,62,3,32,147,195,32,228,255,1842
51  2110 data240,148,201,13,240,38,201,20,240,54,76,175,195,172,62,3,2078
8f  2120 data153,160,4,238,62,3,200,192,255,240,17,162,16,160,0,24,1886
9d  2130 data32,240,255,32,168,194,32,147,195,76,109,194,169,0,172,62,2077
4f  2140 data3,153,160,4,140,63,3,96,169,160,160,4,32,30,171,96,1444
71  2150 data172,62,3,240,184,136,206,62,3,169,0,153,160,4,162,16,1732
d5  2160 data160,0,24,32,240,255,32,168,194,169,32,32,210,255,32,147,1982
21  2170 data195,76,109,194,160,0,169,0,153,160,4,169,7,153,160,216,1925
86  2180 data169,0,200,208,243,96,155,208,204,197,193,211,197,32,201,206,2720
ab  2190 data208,213,212,32,211,212,210,201,206,199,13,211,212,210,201,206,2957
59  2200 data199,32,204,197,206,199,212,200,58,32,32,32,32,32,194,217,2078
57  2210 data212,197,211,13,13,192,192,192,192,192,192,192,192,192,192,192,2758
44  2220 data192,192,192,201,206,208,213,212,32,194,213,198,198,197,210,192,3050
5b  2230 data192,192,192,192,192,192,192,192,192,192,192,192,192,0,192,192,2880
66  2240 data192,192,192,192,192,192,192,192,192,192,192,192,193,195,212,213,3117
d3  2250 data193,204,32,212,197,216,212,192,192,192,192,192,192,192,192,192,2994
f5  2260 data192,192,192,192,192,192,0,192,192,192,192,192,192,192,192,192,2880
3f  2270 data192,192,192,192,192,192,192,189,145,157,176,192,192,192,192,192,2971
ff  2280 data192,192,192,192,192,192,192,192,192,192,192,192,192,192,192,192,3072
a2  2290 data192,192,0,162,1,160,14,24,32,240,255,169,15,141,134,2,1733
7e  2300 data172,62,3,169,0,32,145,179,32,221,189,32,30,171,96,160,1693
67  2310 data0,217,193,195,208,3,76,109,194,200,192,15,208,243,76,125,2254
74  2320 data194,17,29,19,145,147,148,157,133,134,135,136,137,138,139,140,1948
1e  2330 data147,32,32,32,32,32,5,193,196,214,197,206,212,213,210,197,2150
8b  2340 data45,203,201,212,32,212,197,216,212,32,197,196,201,212,207,210,2785
c2  2350 data32,86,49,46,49,13,13,159,208,82,69,83,83,32,158,198,1360
1b  2360 data49,159,32,84,79,32,84,79,71,71,76,69,32,66,69,84,1136
d6  2370 data87,69,69,78,32,66,65,78,75,83,13,13,67,89,65,78,1027
6d  2380 data32,66,79,82,68,69,82,61,76,79,87,32,66,65,78,75,1097
b3  2390 data13,82,69,68,32,66,79,82,68,69,82,61,72,73,71,72,1059
fe  2400 data32,66,65,78,75,13,0,17,208,82,69,83,83,32,158,198,1259
```

```
8e   2410 data56,159,32,84,79,32,
     73,78,73,84,73,65,76,73,83,6
     9,1189
94   2420 data32,84,72,69,32,67,8
     5,82,82,69,78,84,32,66,65,78
     ,1077
5d   2430 data75,13,13,208,82,69,
     83,83,32,158,198,51,159,32,8
     4,79,1419
fb   2440 data32,73,78,80,85,84,3
     2,84,69,88,84,13,13,208,82,6
     9,1174
8f   2450 data83,83,32,158,198,53
     ,159,32,70,79,82,32,70,73,76
     ,69,1349
81   2460 data32,79,80,84,73,79,7
     8,83,13,13,208,82,69,83,83,3
     2,1171
42   2470 data158,198,50,159,32,8
     4,79,32,86,73,69,87,32,84,69
     ,88,1380
33   2480 data84,13,13,208,82,69,
     83,83,32,158,95,159,32,84,79
     ,32,1306
38   2490 data69,88,73,84,13,0,16
     9,3,141,32,208,169,14,32,210
     ,255,1560
96   2500 data169,0,141,77,3,141,
     33,208,169,208,160,195,32,30
     ,171,169,1906
c4   2510 data71,160,196,32,30,17
     1,169,125,160,198,32,30,171,
     169,167,160,2041
5a   2520 data198,32,30,171,169,0
     ,172,64,3,32,115,198,169,192
     ,160,198,1903
23   2530 data32,30,171,56,169,25
     5,229,168,141,63,3,169,191,2
     29,169,172,2247
25   2540 data63,3,32,115,198,169
     ,221,160,198,32,30,171,169,0
     ,172,65,1798
11   2550 data3,32,115,198,169,24
     9,160,198,32,30,171,56,169,2
     55,229,170,2236
de   2560 data141,63,3,169,255,22
     9,171,172,63,3,32,115,198,32
     ,228,255,2129
5a   2570 data240,251,201,133,240
     ,27,201,95,240,22,201,140,20
     8,3,76,11,2289
ce   2580 data198,201,134,240,49,
     201,135,240,39,201,137,208,2
     24,76,47,199,2529
93   2590 data96,173,77,3,208,13,
     169,1,141,77,3,169,2,141,32,
     208,1513
24   2600 data76,77,197,169,0,141
     ,77,3,169,3,141,32,208,76,77
     ,197,1643
c6   2610 data169,142,32,210,255,
     96,32,56,194,173,77,3,208,50
     ,172,64,1933
34   2620 data3,165,168,153,0,205
     ,165,169,153,0,204,160,0,162
     ,0,189,1896
30   2630 data160,4,141,63,3,145,
     168,232,24,165,168,105,1,133
     ,168,165,1845
f1   2640 data169,105,0,133,169,1
     73,63,3,208,229,238,64,3,76,
     255,197,2085
76   2650 data172,65,3,165,170,15
     3,0,207,165,171,153,0,206,16
     0,0,162,1952
aa   2660 data0,189,160,4,141,63,
     3,145,170,232,24,165,170,105
     ,1,133,1705
7d   2670 data170,165,171,105,0,1
     33,171,173,63,3,208,229,238,
     65,3,32,1929
16   2680 data228,255,240,251,201
     ,95,208,142,76,232,196,169,1
     47,32,210,255,2937
96   2690 data173,32,208,72,173,7
     7,3,208,45,160,0,169,0,153,0
     ,204,1677
f0   2700 data153,0,205,140,63,3,
     32,45,194,172,63,3,238,32,20
     8,200,1751
eb   2710 data208,235,169,0,133,1
     68,169,160,133,169,104,141,3
     2,208,169,0,2198
56   2720 data141,64,3,76,232,196
     ,160,0,169,0,153,0,206,153,0
     ,207,1760
03   2730 data140,63,3,32,45,194,
     172,63,3,238,32,208,200,208,
     235,169,2005
9a   2740 data0,133,170,169,224,1
     33,171,104,141,32,208,169,0,
     141,65,3,1863
c6   2750 data76,232,196,32,145,1
     79,32,221,189,32,30,171,96,5
     ,192,192,2020
d9   2760 data192,192,192,192,192
     ,192,192,192,192,192,192,192
     ,192,192,192,192,3072
6b   2770 data192,192,192,192,192
     ,192,192,192,192,192,192,192
     ,192,192,192,192,3072
7d   2780 data192,192,192,192,192
     ,192,0,159,205,69,83,83,65,7
     1,69,83,2039
8e   2790 data32,73,78,32,76,79,8
     7,32,66,65,78,75,58,32,5,0,8
     68
b8   2800 data13,159,205,69,77,79
     ,82,89,32,85,83,69,68,32,73,
     78,1293
c4   2810 data32,76,79,87,32,66,6
     5,78,75,58,32,5,0,13,13,159,
     870
27   2820 data205,69,83,83,65,71,
     69,83,32,73,78,32,72,73,71,7
     2,1231
38   2830 data32,66,65,78,75,58,3
     2,5,0,13,159,205,69,77,79,82
     ,1095
01   2840 data89,32,85,83,69,68,3
     2,73,78,32,72,73,71,72,32,66
     ,1027
2c   2850 data65,78,75,58,32,5,0,
     147,159,194,193,206,203,58,5
     ,0,1478
1f   2860 data159,32,32,32,32,205
     ,197,211,211,193,199,197,58,
     5,0,169,1932
b6   2870 data0,141,63,3,169,2,14
     1,75,3,173,77,3,208,14,169,0
     ,1241
45   2880 data141,77,3,173,64,3,1
     41,62,3,76,87,199,169,1,141,
     77,1417
3d   2890 data3,173,65,3,141,62,3
     ,169,23,160,199,32,30,171,16
     9,0,1403
b2   2900 data172,77,3,32,115,198
     ,169,32,160,199,32,30,171,17
     2,63,3,1628
5a   2910 data169,0,32,115,198,17
     3,62,3,205,63,3,240,24,173,6
     3,3,1526
c7   2920 data141,78,3,32,18,203,
     238,63,3,32,228,255,240,251,
     201,95,2081
e6   2930 data240,3,76,87,199,76,
     232,196,0,255,0,255,255,255,
     255,255,2639
```

PROGRAM: EDITOR.BAS

```
d5   10 if fl=0 then poke56,128:g
     osub 7000: goto 100
0d   20 if fl=2 then fl=1: load f
     i$,de,1
e8   30 if fl=1 then 3000
7c   100 poke53280,0:poke53281,0:
     printchr$(147)tab(14)"[c8]te
     xt editor"
c0   110 print"[down3]"tab(10)"1.
      enter main editor"
87   120 print tab(10)"2. save da
     ta"
1f   130 print tab(10)"3. load da
     ta"
b6   140 geti$:ifi$=""then140
d2   150 ifi$<"0"ori$>"3"then140
57   160 on val(i$) goto 500,2000
     ,1000
25   170 rem
44   500 sys 49664: goto 100
d2   1000 gosub 10000: fl=2:goto
     20
4b   2000 gosub 10000
e8   2010 if b$="b"then sys 12*40
     96 : sys 32768 fi$,de,2,2048
     0,29200 : goto 100
e9   2020 if b$="k"then sys 12*40
     96+6 : sys 32768 fi$,de,2,20
     480,29200 : goto 100
37   3000 if b$<>"b"then 3010
d0   3005 sys12*4096+3: poke833,t
     2:poke170,a3:poke171,a4:goto
      100
ed   3010 sys12*4096+9: poke832,t
     1:poke168,a1:poke169,a2:goto
     100
6c   6000 data 32,212,225,32,253,
     174,32,138,173,32,247,183,16
     5,20,72,165,21,72,32,253
0f   6010 data 174,32,138,173,32,
     247,183,165,1,41,254,133,1,1
     66,20,164,21,104,133,21
92   6020 data 104,133,20,169,20,
     32,95,225,165,1,9,1,133,1,96

2a   6030 y.
35   6900 :
05   7000 restore: for i=0 to 54:
      read x: poke32768+i,x: t=t+
     x:next:return
d4   7010 if t<>5940 then print"d
     ata error": return
72   10000 input "[clr,rvson]b[rv
     soff]asic rom or [rvson]k[rv
     soff]ernal rom ";b$
5e   10010 if b$<>"b" and b$<>"k"
      then 10000
f0   10020 input "[down]file name
     ";fi$
04   10030 input "[down]device nu
     mber";de
b1   10040 t1=peek(832):t2=peek(8
     33):
61   10050 a1=peek(168):a2=peek(1
     69):a3=peek(170):a4=peek(171
     ):return
```

PROGRAM: MOVER.MC

```
75   10 rem *********************
     ***
58   20 rem * adventure kit part
     2 *
07   30 rem *   data mover code
       *
07   40 rem *********************
     ***
50   2000 forl=0to21:cx=0:ford=0t
     o15:reada:cx=cx+a:poke49152+
     l*16+d,a:nextd
82   2010 reada:ifa<>cxthenprint"
     error in line";2040+(l*10):s
     top
0f   2020 nextl:end
```

```
c0  2040 data76,14,192,76,81,192
    ,76,148,192,76,215,192,0,0,1
    69,0,1699
f5  2050 data133,251,141,12,192,
    169,160,133,252,169,192,141,
    13,192,169,0,2319
31  2060 data133,253,169,80,133,
    254,32,26,193,160,0,185,0,20
    4,145,253,2220
ce  2070 data200,208,248,230,254
    ,160,0,185,0,205,145,253,200
    ,208,248,230,2974
6c  2080 data254,173,64,3,145,25
    3,200,165,168,145,253,200,16
    5,169,145,253,2755
e5  2090 data96,169,0,133,251,14
    1,12,192,169,80,133,252,169,
    112,141,13,2063
78  2100 data192,169,0,133,253,1
    69,160,133,254,32,26,193,160
    ,0,177,251,2302
49  2110 data153,0,204,200,208,2
    48,230,252,160,0,177,251,153
    ,0,205,200,2641
07  2120 data208,248,230,252,177
    ,251,141,64,3,200,177,251,13
    3,168,200,177,2880
ee  2130 data251,133,169,96,169,
    0,133,251,141,12,192,169,224
    ,133,252,169,2494
77  2140 data0,141,13,192,169,0,
    133,253,169,80,133,254,32,26
    ,193,160,1948
3c  2150 data0,185,0,206,145,253
    ,200,208,248,230,254,160,0,1
    85,0,207,2481
4a  2160 data145,253,200,208,248
    ,230,254,173,65,3,145,253,20
    0,165,170,145,2857
78  2170 data253,200,165,171,145
    ,253,96,169,0,133,251,141,12
    ,192,169,80,2430
26  2180 data133,252,169,112,141
    ,13,192,169,0,133,253,169,22
    4,133,254,32,2379
f8  2190 data26,193,160,0,177,25
    1,153,0,206,200,208,248,230,
    252,160,0,2464
75  2200 data177,251,153,0,207,2
    00,208,248,230,252,177,251,1
    41,65,3,200,2763
2f  2210 data177,251,133,170,200
    ,177,251,133,171,96,160,0,12
    0,165,1,41,2246
5d  2220 data252,133,1,177,251,1
    45,253,24,165,251,105,1,133,
    251,165,252,2559
cc  2230 data105,0,133,252,24,16
    5,253,105,1,133,253,165,254,
    105,0,133,2081
15  2240 data254,165,251,205,12,
    192,208,219,165,252,205,13,1
    92,208,212,165,2918
cb  2250 data1,9,3,133,1,88,96,1
    92,192,192,192,192,192,192,1
    92,192,2059
```

PROGRAM: TEXT.MC

```
85  10 rem*********************
    **
b8  20 rem* adventure kit part 2
    *
6f  30 rem*   text code
    *
b7  40 rem*********************
    **
cb  2000 forl=0to8:cx=0:ford=0to
    15:reada:cx=cx+a:poke51968+l
    *16+d,a:nextd
82  2010 reada:ifa<>cxthenprint"
    error in line":2040+(l*10):s
,   top
0f  2020 nextl:end
90  2040 data32,110,203,141,77,3
    ,32,110,203,141,78,3,32,110,
    203,141,1619
ee  2050 data75,3,172,78,3,173,7
    7,3,208,15,185,0,205,133,251
    ,185,1766
30  2060 data0,204,240,54,133,25
    2,76,53,203,185,0,207,133,25
    1,185,0,2176
7a  2070 data206,240,39,133,252,
    120,165,1,41,252,133,1,160,0
    ,177,251,2171
04  2080 data153,0,202,240,3,200
    ,208,246,165,1,9,3,133,1,88,
    32,1684
ed  2090 data124,203,169,0,160,2
    02,32,30,171,96,160,100,173,
    32,208,162,2022
78  2100 data255,142,32,208,202,
    208,250,136,208,245,141,32,2
    08,96,32,253,2648
11  2110 data174,32,138,173,32,2
    47,183,165,20,164,21,96,174,
    75,3,160,1857
54  2120 data0,24,32,240,255,96,
    0,0,0,0,0,0,0,0,0,0,647
```

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B R E A K

OOPS!

Slight changes were made to the listing of our C16 and Plus/4 program REBOUND in the October 1987 issue of the magazine after the text was produced.

The listing was correct in the magazine. There is only one part to it, not two as indicated in the text. This listing should be entered as described using the MONITOR function of the computer.

To use the program you should LOAD it from within the monitor as follows:

L "REBOUND",x,1

where x is 1 if using tape or 8 if using disk. Then enter G1000 to RUN the program.

'Thing' Competition Winners

Are you a winner in the Thing competition from August 1987? Read on and find out:

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Bug Finder

We'd like to remind our readers that we run a Bug Finder service.

If you have typed in one of our programmes and despite much checking, you still can't get it to run, then send us the following:

Two copies of your program on tape or disk.
A description of your problem.
If possible a listing of your work (you may omit this).
A stamped, self addressed envelope for return of the program to you.

Should any of the above be missing then we will not be able to deal with your query.

We will try to point out where you have made errors and place a corrected copy of the program back on to your tape or disk before we return it to you.

Do not send a program to us as soon as it stops working, please check it several times first.

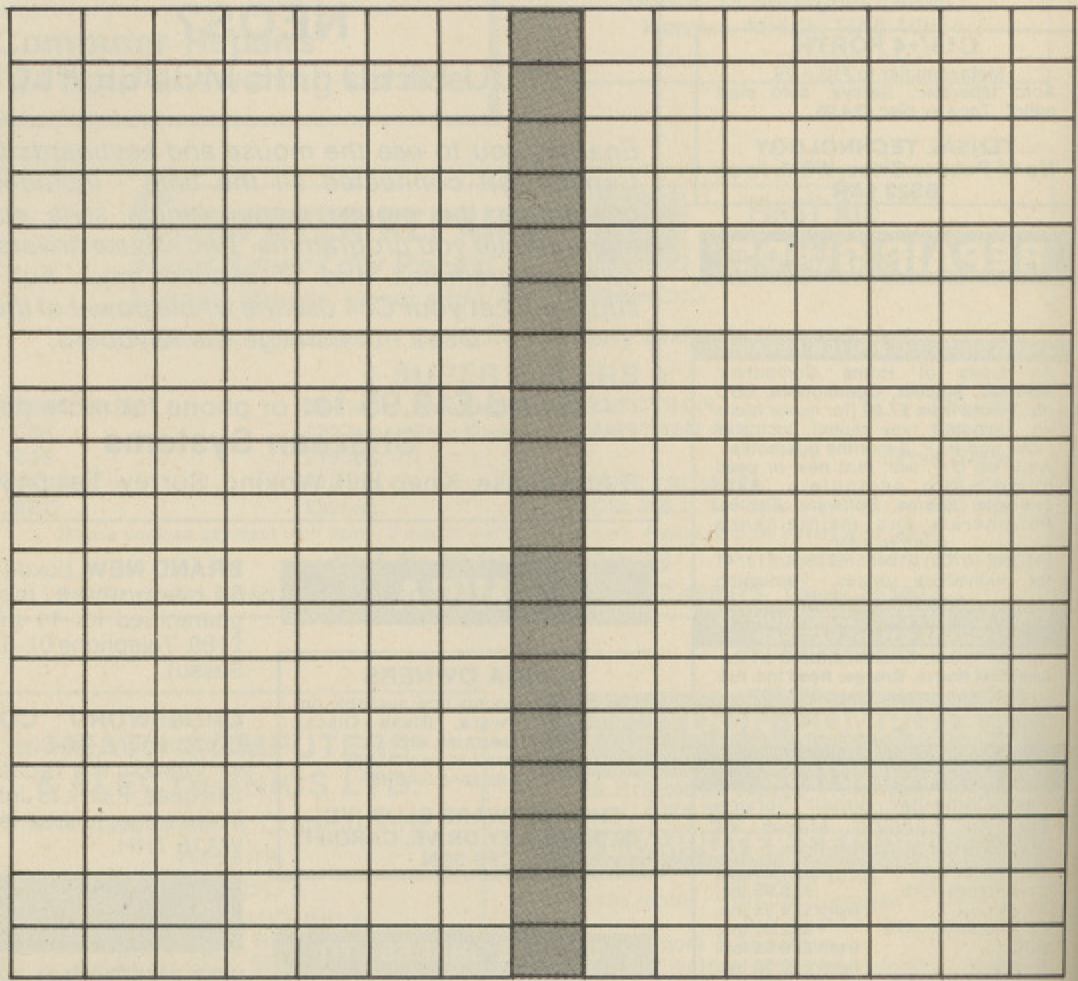
We do get a large number of queries and so it may take a while for us to deal with yours personally.

Note: we can only deal with problems relating to programmes published in *Your Commodore.*

Puzzle

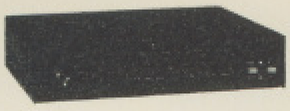
Solve the eighteen clues below and then write the answers, which are all computer related, on the grid in such a way that reading down the central column will give you a phrase associated with computers.

1. Train stops temporary storage area (7)
2. Set of instructions on the box (7)
3. Break in true print (9)
4. Reusable memory from 1000 pointless ropes (5)
5. Language rules sound like VAT in Soho (6)
6. Naval computer? (9)
7. Bloomer goes round print producer (10)
8. Point sorceress on or off (6)
9. Cast tees off for storage device (8)
10. Poem in two thousand about data transmitter (5)
11. Program made few roast (8)
12. Vindicate word alignment (7)
13. Endless foreign friend gets a computer (5)
14. A red tuba produces data transmission frequency (4, 4)
15. Using DDT on number 2? (9)
16. Language hurried after castle (7)



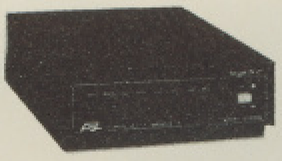
17. Tour in east is part of the program (7)
18. Machine code aide-memoires (9)

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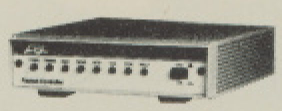
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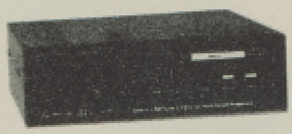
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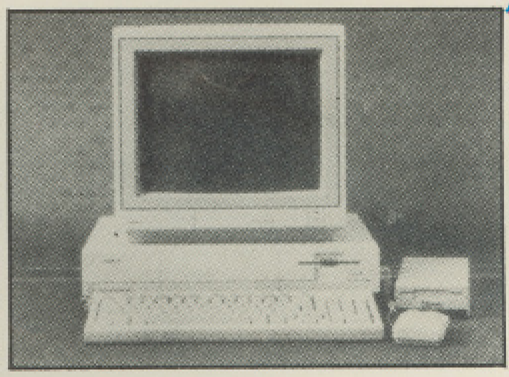
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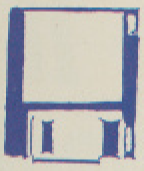
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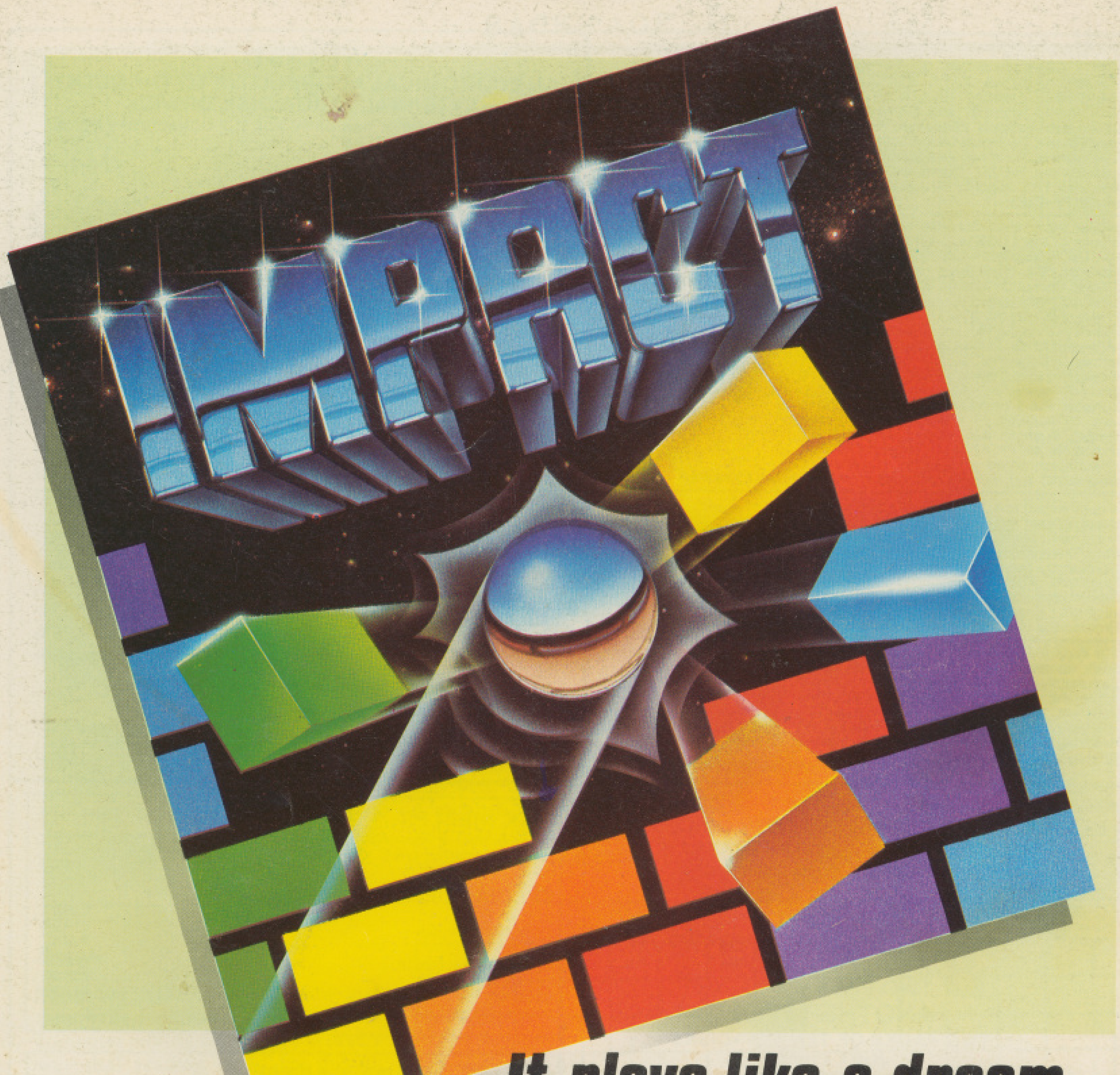
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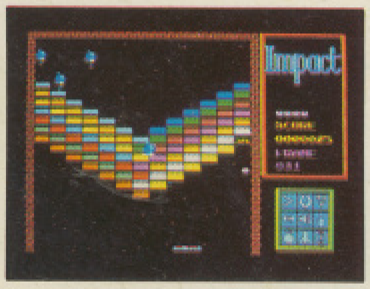
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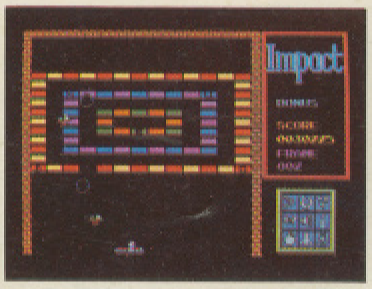
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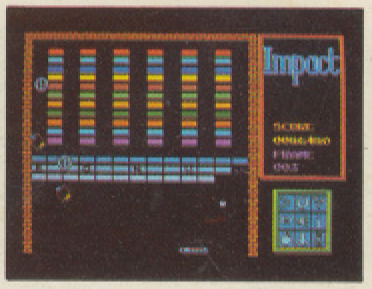


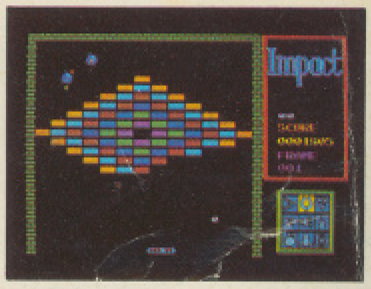
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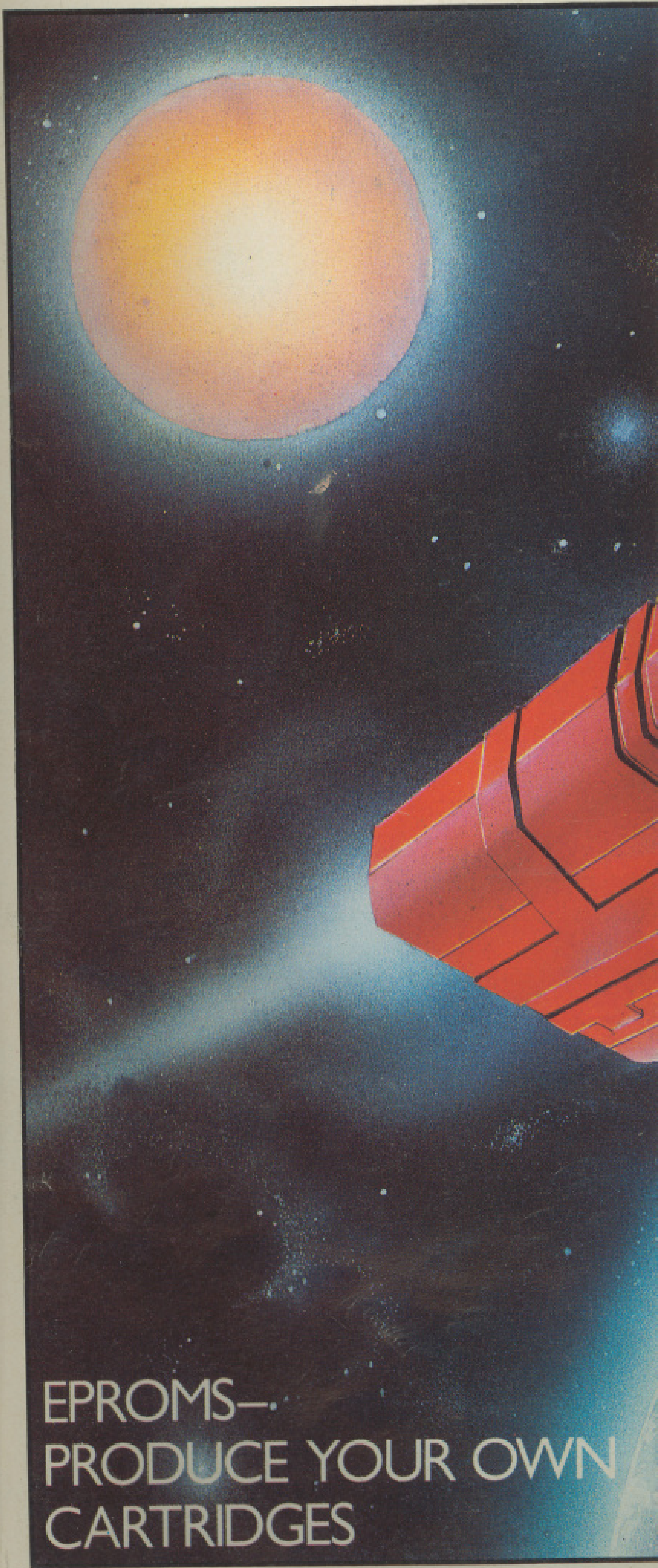
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